Technical Data Sheet (TDS) - DPQA0001109-001
Conductive Coatings Selection Matrix - Injection Moulded Enclosures

Conductive Paints for EMC Shielding of Injection-Moulded Parts

Conductive coatings are used to create a continuous, grounded Faraday cage on non-conductive polymer housings (PC, ABS, PC/ABS, PA, etc.) to meet EMC requirements such as radiated emissions (RE) and radiated immunity (RI).

Below is a structured breakdown relevant to enclosure design and small-to-medium production.

Coating types compared

- Silver-Coated Copper (Ag/Cu)
- Pure Copper
- Nickel based
- Carbon /Graphite

Quick Performance comparison

Coating Type	Shielding (dB)	Conductivity	Corrosion Resistance	Cost	Typical Use
Silver/Copper	70–90	Excellent	Good	High	Compliance-critical systems
Copper	60–80	Excellent	Moderate	Medium	Industrial indoor
Nickel	40–70	Moderate	Excellent	Medium	Harsh environments
Carbon/Graphite	20–50	Low	Excellent	Low	ESD / light shielding

1. Silver-Coated Copper (Ag/Cu)

Performance level: High
Shielding effectiveness: 60–90 dB (30 MHz–1 GHz typical)
Surface resistivity: ~0.02–0.1 Ω/sq

Advantages

- Excellent conductivity
- Good corrosion resistance (better than pure copper)
- Industry standard for demanding applications

Limitations

- Higher material cost
- Requires controlled application thickness (25–50 µm typical)

Best suited for

- Industrial controls
- Medical devices
- Automotive modules
- Aerospace sub-assemblies

2. Pure Copper Conductive Paint

Performance level: High (initially)
Shielding effectiveness: 60–80 dB
Surface resistivity: ~0.01–0.05 Ω/sq

Advantages

- Lower cost than Ag/Cu
- Very good initial shielding

Limitations

- Oxidation risk
- May require protective topcoat
- Long-term stability lower than Ag/Cu

Best suited for

- Cost-sensitive industrial products
- Indoor electronics

Not ideal for humid or automotive environments without sealing.

3. Nickel-Based Conductive Paint

Performance level: Medium
Shielding effectiveness: 40–70 dB
Surface resistivity: ~0.1–1 Ω/sq

Advantages

- Lower cost
- Good corrosion resistance
- Stable in harsh environments

Limitations

- Lower conductivity
- Slightly heavier coating

Best suited for

- Marine or high-humidity environments
- Rugged outdoor equipment

4. Carbon / Graphite Conductive Coatings

Performance level: Low–Medium
Shielding effectiveness: 20–50 dB
Surface resistivity: 10–100 Ω/sq

Advantages

- Low cost
- Good for ESD control
- Lightweight

Limitations

- Not suitable for high-frequency EMI
- Limited high-performance compliance use

Best suited for

- ESD control
- Consumer electronics
- Non-critical shielding

Application Considerations (Critical for Performance)

1. Substrate Compatibility

- ABS and PC/ABS: Excellent adhesion
- PC: Requires surface prep
- PA: Often needs primer

2. Grounding Strategy

Shielding paint without a reliable ground path is ineffective.

Common solutions:

- Conductive gasket + plated bosses
- Masked grounding pads
- Embedded metal inserts

3. Coating Thickness Control

Typical wet spray:

- 25–50 µm dry film thickness
  Too thin → poor shielding
  Too thick → cracking, weight increase

4. Production Method

- Manual HVLP spray (low volume)
- Automated spray line (repeatability)
- Masking features should ideally be incorporated into the mould tool to ensure repeatability, reduced labour, and consistent coating boundaries.

  Where this is not feasible, we can provide a defined masking design and controlled application service to achieve accurate and repeatable shielding layouts.

Internal surfaces coated with silver-coated copper conductive paint providing typical shielding effectiveness of 70–90 dB (30 MHz–1 GHz) when properly grounded. Nominal surface resistivity ≤0.1 Ω/sq at 25 µm dry film thickness.

Engineering Recommendation

For professional EMC compliance (industrial, automotive, medical), we receommed Silver-coated copper conductive coating + defined grounding feature + conductive gasket interface.

We generally avoid carbon unless it is strictly an ESD control requirement.