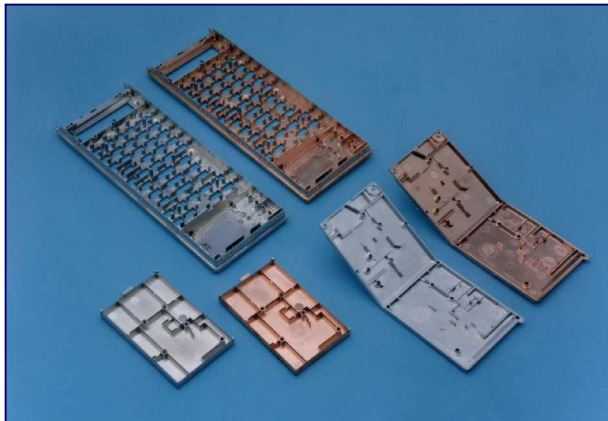


EMC Vacuum Metallisation

Conductive metallic coatings on mainly plastic housings of electronic equipment to ensure Electro Magnetic Compatibility (EMC)



Reasons

The use of plastics instead of metals for electronic device housings is increasing, as a result of good processing and manifold design options for plastics.

Due to their electric non-conductivity, plastics are largely permeable for electromagnetic waves. This can affect or disturb the function of electrical or electronic components.

In order to limit the sending and receiving of electromagnetic interferences, appropriate laws for their restriction have been enacted.

Manufacturers are obliged to observe the EC standard covering electromagnetic compatibility of appliances, in force since 1 January 1996, and to demonstrate such observation.

Kunststoffgehäuse müssen eine ausreichende Schirmdämpfung (dB) für elektromagnetische

More Information:

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Technology

Using vacuum coating technologies it is possible to deposit metallic coatings mainly on the insides of these plastic housings.

Plastic housings must have sufficient screen dampening (dB) for electromagnetic waves in the frequency range of 10 kHz up to 140 GHz.

The screen dampening to be achieved is determined by the surface resistance of the coating.

The desired metals are deposited on the plastic surfaces under high vacuum.

Deposited metal layers

There are virtually no restrictions regarding eligible metals and workable plastic materials.

However, due to practical and cost considerations, some metal layers have become more favoured, e.g.:

Aluminium	2...3 µm, but also with greater thickness up to 10 µm
Aluminium / + HMDS – as protection layer	2,5 10 µm / 50 70 µm
Copper / + Nickel – as protection layer	1 4 µm / 0,2 0,3 µm
Copper / + Cr Ni – as protection layer	1 4 µm / 0,2 µm
Copper – Tin / Cu-Sn	1 5 µm
Silver and gold	are also possible

Safeguarding EMC

Requirements of electrical and electronic equipment housings to safeguard electromagnetic compatibility/ EMC:

They must give protection against:

- emission of housing internal fields, so that other electronic equipment is not impaired and/or persons adversely affected
- irradiation of fields, to protect electronics within the housing from impairment
- electrostatic discharges and their accompany fields, to avoid disturbance of electronics within the housing

Plastic materials are non-conducting and good electrical insulators as a rule and can perform this shielding function only if they have been made sufficiently surface conducting through metallisation.

Physical principles of shielding

Shielding is the weakening of fields through inserting a body or shield between transmitter and receiver. The definition of **Dampening factor S** is:

$$\text{Shield dampening factor } D = 20 \lg(F_{\text{without}} / F_{\text{with}}) \text{ dB}$$

F Field strength without or with shield, respectively
lg the decadic logarithm
dB specified in dB and should be 40 dB as a minimum for medium quality

Shielding requirements depend on the types of fields (electrical, magnetic or electromagnetic), their frequency, and on the distance from the transmitter.

For electromagnetic waves shield dampening is achieved through reflection on the border surfaces and absorption inside the shield. Shield dampening is increased by several reflecting border surfaces (i.e. a layer system) and greater layer thickness (frequency dependent, Skin effect) managing the depth of penetration.

Requirements re. housings

Housings must be made of a material that withstands the process specific thermic load and safeguards sufficient adhesion of the coating material. Not all plastic materials fulfil that requirement, at least not until they are suitably pre-treated (eg. priming, tempering)

Housings should be made in accordance with the requirements of housing manufacturers and those of the coating process (external dimensions, openings, cavities, rear sections, joints).

Metallisation of freshly lacquered items has a positive effect on adhesion. Extended interim storage is therefore disadvantageous. Consequently, a combination of production and coating of housings in close local proximity is most suitable.