GEHÄUSE SYSTEME

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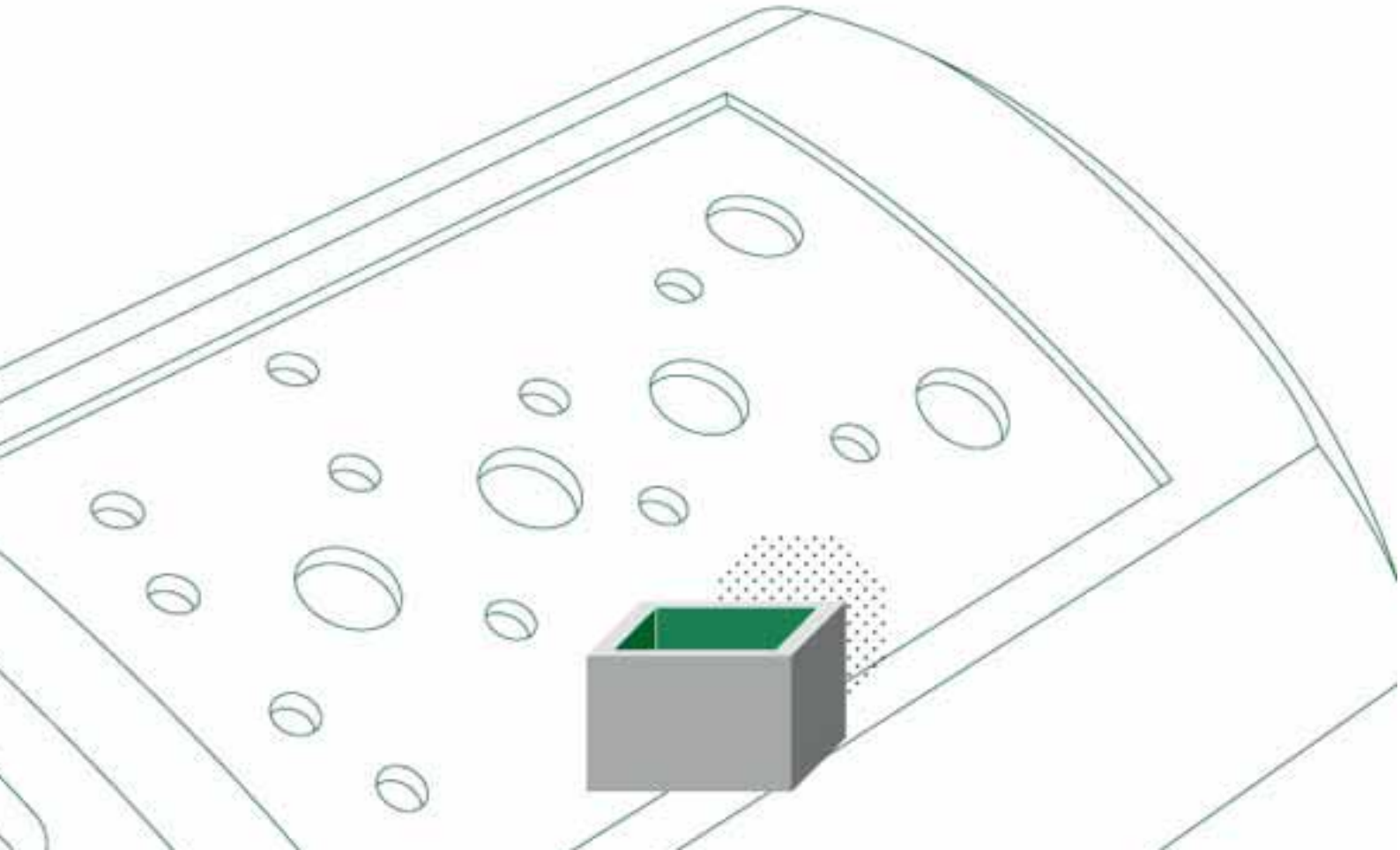
# EMC – ALVACOAT® 250



## SERVICES

OKW Gehäusesysteme is your competent partner for providing EMC protection for your electronics.

To begin with, it is worth having a look at the interrelationship between EMC and Plastic enclosures and the measures required to reduce the interference radiation. We can support you in your projects.

Thanks to the investment in our own vapour-plating facility and the related production process, we are now able to offer a further step in the direction of *Everything from one supplier*. The new facility was specially trimmed to meet the EMC requirements at OKW.

Applications:
- Medicine, Laboratory, Wellness
- Machine building
- Household appliances
- Communication, Office
- Measuring and controlling
- Military

## DESIGN EXAMPLES

Plastic enclosures with aluminium coating.

## EMC AND PLASTIC ENCLOSURES

The non-conducting material used for plastic cases, for example ABS and PC, has advantages in voltage and contact protection compared with metal materials. It behaves like an insulator.

For devices that cause electromagnetic interference (see also attachment below) or whose operation is impaired by such interference, plastic cases without special measures offer only moderate protection.

The main reasons for EMC-interference are:

- within low range of frequency < 100 MHz
  conductive interference

- within medium range of frequency 30-300 MHz
  radiation from cables (cable serves as antenna)

- within high range of frequency > 300 MHz
  interference radiation penetrating through material and openings

# EMC – ALVACOAT® 250

To meet current EC directives and standards, a variety of measures is required. For reasons of cost-effectiveness we recommend the following procedure:

- The complete electric/electronic equipment, including board layout, should be designed in such a way that EMC requirements are met. This also includes a reduction in conducted interference and the elimination of cable interference radiation.

- Partial screening of the sensitive components or interference radiators.

- Reduction of interfering radiation entering through openings.

- Increase in the screening effect of the case.

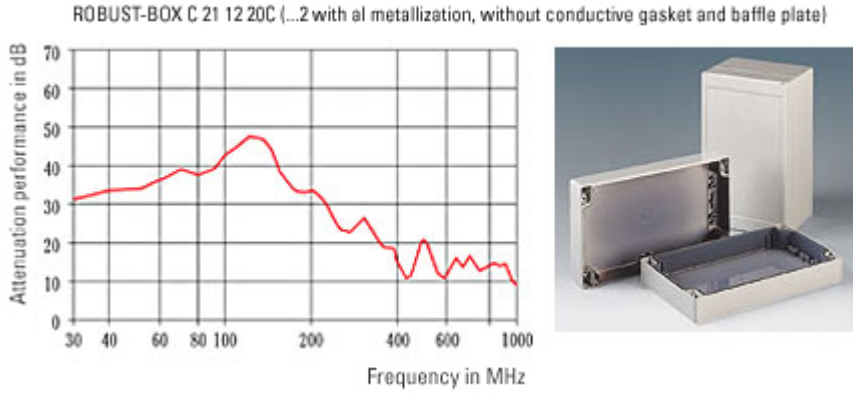
## METALLIZATION OF PLASTIC ENCLOSURES

OKW Gehäusesysteme offers an aluminium metallization for the interior of the cases on demand. The coating is applied in a vacuum (ALVACOAT® 250) and, with a thickness of approx. 2.5 µm in the base area, guarantees good adhesion and a shielding effect – depending of the type of case and contact. For special applications we can also offer a thickness > 5 µm. For materials Cycolac S157, Rotec 1001 FR/E, Rotec 3001 and Terluran GP-22 in the OKW standard colours there's a certification according to UL 746C for the ALVACOAT-process available.

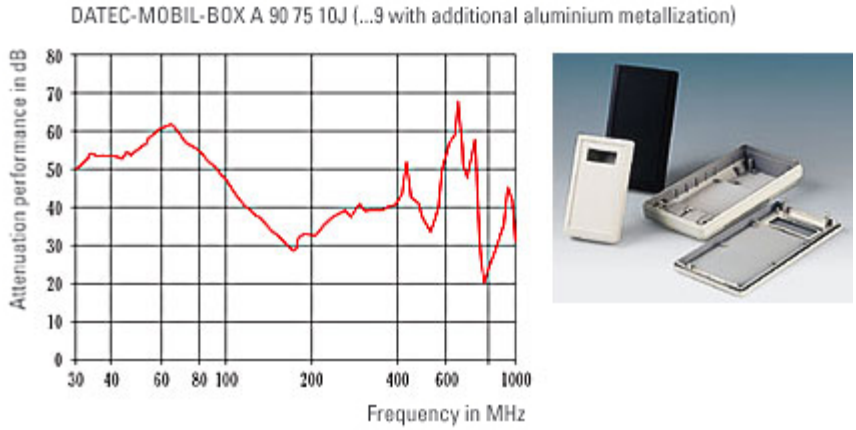
ALVACOAT® is a registered trademark of OKW Gehäusesysteme.

### Attenuation values when metallizing OKW standard cases

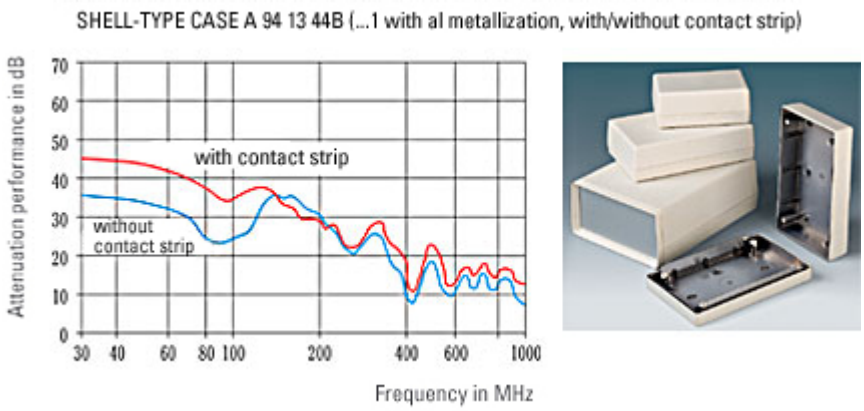
Result ROBUST-BOX (ABS, PC) with aluminium metallization
(Source: report No. 9012, Prof.-Dr. Ing. Adolf J. Schwab, TH Karlsruhe)




Result DATEC-MOBIL-BOX (ABS) with aluminium metallization
(Source: measure from 08.07.96, Prof.-Dr. Ing. Adolf J. Schwab, TH Karlsruhe)



Result SHELL-TYPE CASE with aluminium metallization with/without contact strip - available as accessory
(Source: report No. 9016, Prof.-Dr. Ing. Adolf J. Schwab, TH Karlsruhe)




Thicker layers and further special versions, e.g. with partial coverings (additional tooling charges) available on demand.

In order to meet the recommendations and regulations of EMI, the aluminising of cases forms an important part, but is not always sufficient. For this reason it is necessary to have your complete system tested to ensure it meets the required standards.

## ADDITIONAL EMC-MEASUREMENTS

As almost every case is provided with openings and cable connections which reduce the shielding effect, it is important to observe the following recommendations

**Opening within the case**

The interference energy which is released through the opening largely depends on the following facts:
- maximum linear size
- frequency and/or wave length of the interference energy
- polarisation of the wave
- distance from radiation
- field type

From experience, an opening should have an attenuation performance of at least 20 dB – this means:

| Frequency | max. length of slot |
|---|---|
| 30 MHz | 45.7 cm |
| 100 MHz | 15.2 cm |
| 300 MHz | 5.1 cm |
| 500 MHz | 3.1 cm |
| 1000 MHz | 1.5 cm |

**Cable radiation**

To reduce the radiation between cable, plug and case we recommend as follows:

- reducing the amount of openings
- removing lacquer, colours and oxides from the contact areas
- direct contacting between cable shield and coating required
- use shielded cables

**Cable glands**

In order to maintain the protection class of the case and to improve the cable radiation, a suitable screw fitting of cables becomes necessary.

**Improvement of contact**

As contact for our coated plastic cases we offer gaskets consisting of a foam core with silicone material. The silicone sheath contains copper particles that are silver-plated.

**Display windows**

Display windows and adhesive foils should be provided with a conductive coating in order to guarantee a connection to the case.

Please keep in mind that the use of external accessories may influence e.g. the protection class and can cause corrosion. For this reason, we recommend consulting the supplier prior to the use of these external accessories.

## COATING MATERIAL

Constitution (values in %):

| Si | Fe | Cu | Mn | Mg | Cr | Zn | Ti | AE* | Al |
|---|---|---|---|---|---|---|---|---|---|
| 0.002 | 0.005 | 0.003 | 0.001 | 0.001 | 0.001 | < 0.002 | < 0.001 | < 0.003 | Rest |

Material No. / Name: EN AW-1098 / EN AW-Al99,98
Certification approval test: EN 10204/3.1B

*AE = other elements

## QUALITY

Quality test according test criteria. Each batch we make tape tests and surface resistance measurements of 16 parts.

## TEST CRITERIAS

| Test | Test of measurement | Test equipment | Test equipment manufacturer |
|---|---|---|---|
| Adhesive strength DIN EN ISO 2409 | Tape Test | GT2 | Byk Gardner, USA |
| Adhesive strength of each batch and each series | Tape Test | Tesa 4304 H | OKW |
| Surface resistance measurement of each batch and each series | Resistance measurement between measured peaks at an interval of 50 mm below 0,5 Ohm in base area | Voltkraft 5050E | Voltkraft |
| Resistance to heat | Hot storage | Heat chamber 12 hours at +60° | OKW |

| | | | |
|---|---|---|---|
| Resistance to cold | Cold storage | Climatic chamber<br>12 hours at -25° | OKW |
| Resistance to thermal shocks | Hot and cold storage | Climatic chamber<br>from -25° to +60°<br>Sequence:<br>12 hours at +60°<br>12 hours at -25°<br>12 hours at +60°<br>12 hours at -25° | OKW |

## FIXED COSTS

According quotation.

## SUPPLY

Same as standard (in PE-bags, in layers in the cartons).

Special agreements possible.

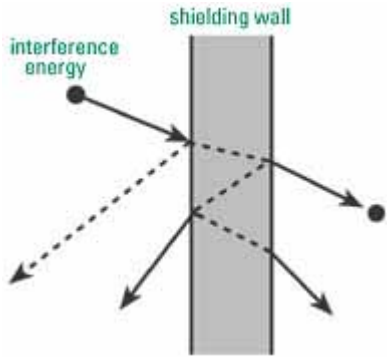
Quantity differencies + 10 % possible.

## ATTACHMENT

**Effect of electromagnetic shielding**

In order to reduce interference radiation, the shielding of cases for ranges exceeding 100 MHz is of vital importance.

"Shielding" is the ratio of field intensity in front of and behind the shielding wall. The effect of electromagnetic shields is based on a combination of several effects.



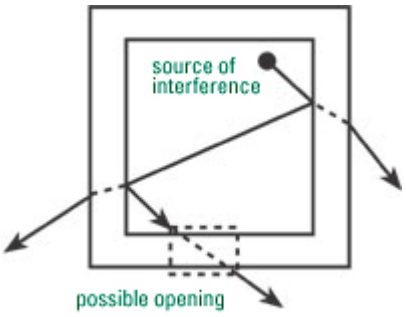

In an electromagnetic wave hits metal, part of the wave is reflected. Another part of the wave penetrates the metal layer and is transformed into heat. The remaining part penetrates the metal layer and finally represents the source of interference.

**Interference within or outside the device**

A decision has to be made whether an interference has to be shielded outside or within the device.

If the interference proves to be outside the device, the main part of the interference will be absorbed and reflected.

However, if the interference proves to be within the device, the waves hit one of the shielding walls again and again due to a multiplied reflection, which in turn reduces the energy to the extent of absorption. If there is an opening within the case, part of the interference energy will be released. For this reason, interference within the device is more frequent in practical use.

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