

Compashield, shielding solutions .



050812 / MM

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What is Compashield ?

- **Compashield is the trademark for our injection moulded products based on conductive silicone rubber.**
- **There are three main products. Compashield components, frames and cans.**



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What is Compashield component ?

- It is a shielding component moulded in conductive silicone rubber in exact size and shape for the application.
- Components are used for grounding and shielding small parts, as for instance cameras.



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What is Compashield frame ?

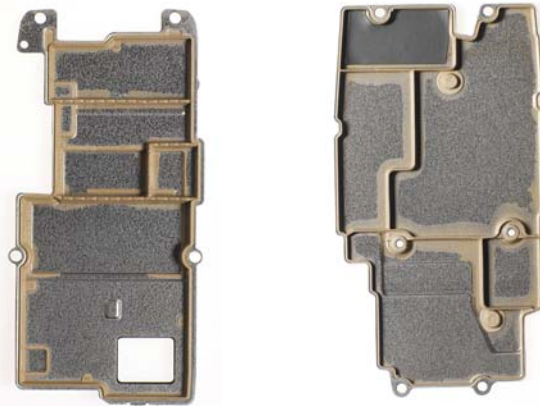
- It is a plastic frame with an over-moulded conductive silicone gasket.
- The plastic frame is used as a support and as spacer and as an assembly guide.
- The frame is used for EMI shielding between two PCB's.



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What is Compashield can ?

- It is a metal can with an over-moulded conductive silicone gasket.
- The metal is used as a shielded housing around components on a PCB.
- The gasket is used to build internal walls and to contact the PCB.



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Advantages with Compashield can ?

- **Easy to assemble and disassemble for inspection and repair.**
- **Cost effective with several EMI shielded chambers in one part.**
- **Space saving especially with numerous chambers.**
- **Height saving compared with soldered can with fence and lid.**
- **Offers environmental sealing of the PCB.**

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Are there different types of Compashield cans?

- **Compashield - cans are divided in three different groups according to the material in the can.**
 - Sheet metal cans
 - Die-casted cans
 - Metal and plastic combination cans

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What type is the most used today ?

- **Compashield - can made of deep drawn sheet metal is today the most widely used compashield product.**
- **This type of shielding can has in several projects been used instead of the conventional soldered metal cans with fence and lid.**



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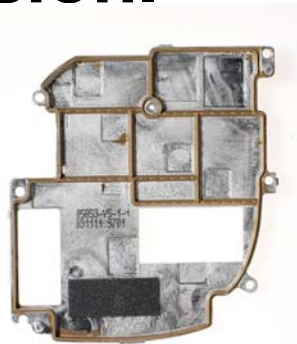
How to design a sheet metal can ?

- **Stainless ASTM 304 is the most common compromise between stiffness, shielding, ageing properties and price.**
- **Typical metal thickness 0,2-0,3 mm.**
- **Space requirement on PCB is 1,5 mm at periphery and 1,0 at partition walls.**
- **Our experts will gladly assist our customers to design the best shield for each application.**

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Why use die casted cans ?

- **Compashield - can made of die-casted metal as Al, Mg and Zn are used when there is a need to stiffen up the construction.**
- **The die casted metal could also be used to remove heat from components through heat dispersion.**



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Why use cans of metal and plastic combinations ?

- This type of shielding can can be used if needed to add design features as holders, hooks etc to the can.
- This can also offers a possibility to stiffen up the construction and for heat dispersion.



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Conductive Silicone Rubber

- **The silicone rubber used for shielding cans is developed and compounded by Nolato Silikonteknik.**
- **We mix silicone rubber and conductive particles and additives to optimise shielding effect and raw material cost and production efficiency and mechanical properties such as hardness and compression set.**

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Typical material data

- 8604 and 8630 are today the two most commonly used materials.
- Special grades are developed if needed.

Property	Test procedure	Unit	8604	8630
Base material			Silicone rubber	Silicone rubber
Conductive filler			Silver / copper	Silver / glass
Volume resistivity	Mil-G-835388	mOhmcm	1	2
Density	ISO 2781	g/cm ³	3,4	1,9
Hardness	ISO 7619	Shore A	75	75
Tensile strength	ISO 37	Mpa	1,8	1,5
Elongation at break	ISO 37	%	430	90
Tear strength	ISO 34-1C	N/mm	10	11
Compression set, 22h/125 C	ISO 815	%	40	20
Compression modulus, 10% strain , 20% strain	ISO 7743	MPa	8,9 9,0	9,2 9,8

8604

- **Developed especially for Compashield components.**
- **Very low volume resistance makes this material excellent for flexible electrical contacts and grounding gaskets.**
- **Based on silvered copper particles and a high temperature curing silicone system.**

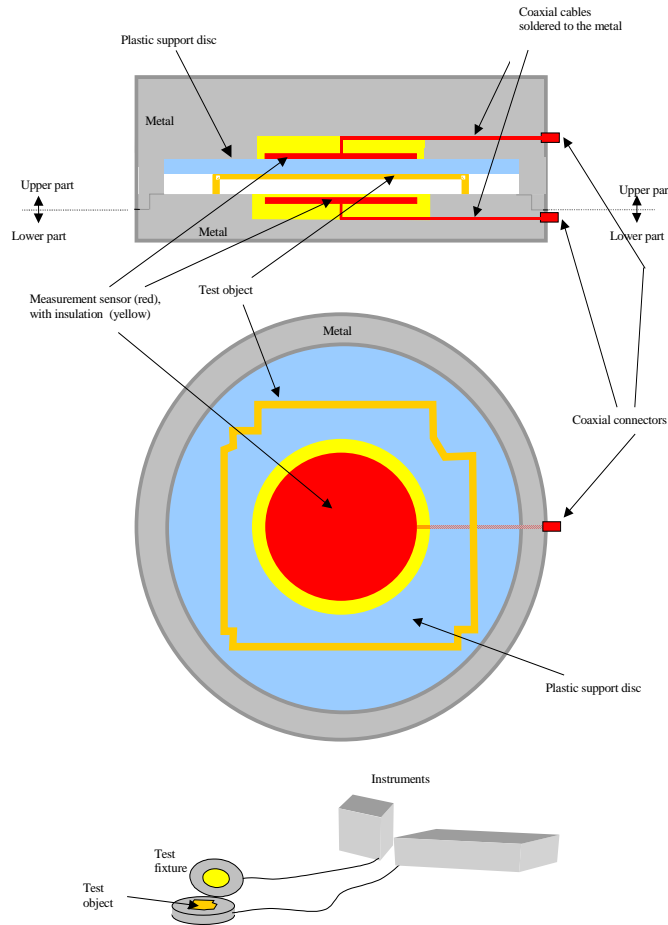
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8630

- **Developed especially for over-moulded shielding frames and cans.**
- **Based on silvered glass particles and a high temperature curing silicone system.**
- **Shields better and costs less than the traditional silvered copper.**
- **Lower resistance and improved compression set gives improved ageing properties compared to the earlier used 8603 and 8610.**

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Shielding Effect Measurement

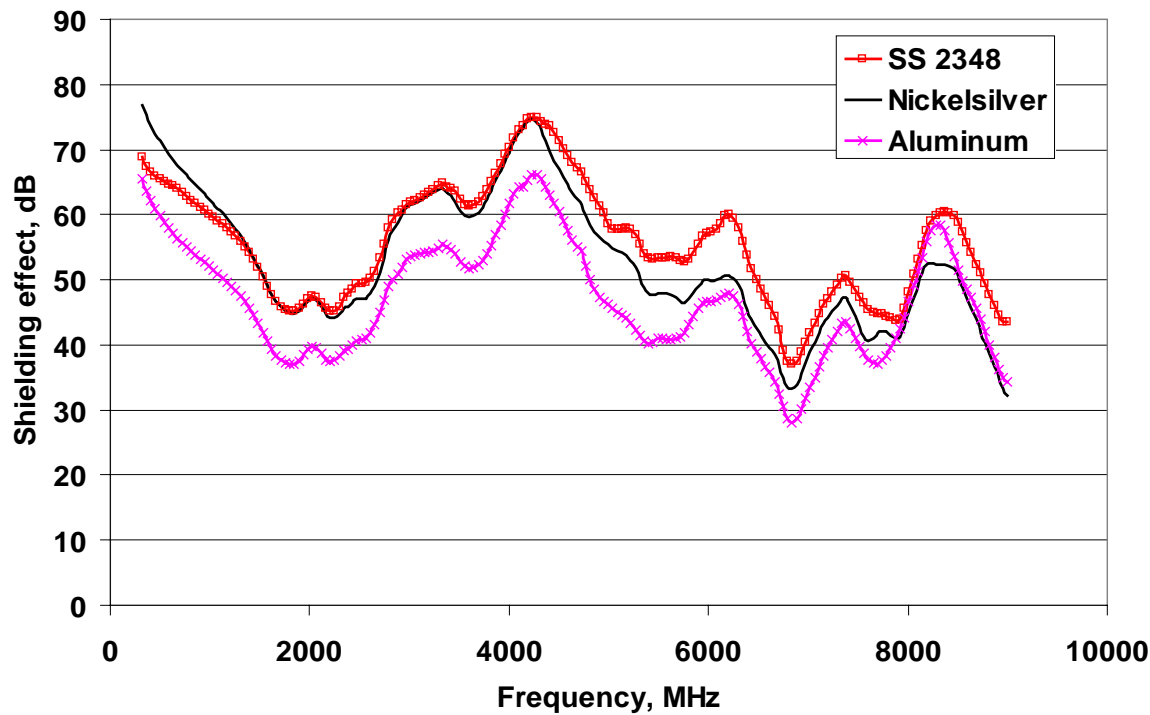


- Standard test for shielding cans.
- Test used to compare different designs and ageing properties.
- Modified MIL STD 285.
- Network Analyzer Agilent PNA E8358AR.
- $SE = 20 \cdot \log(V_0/V_1)$ [dB].
- Test can



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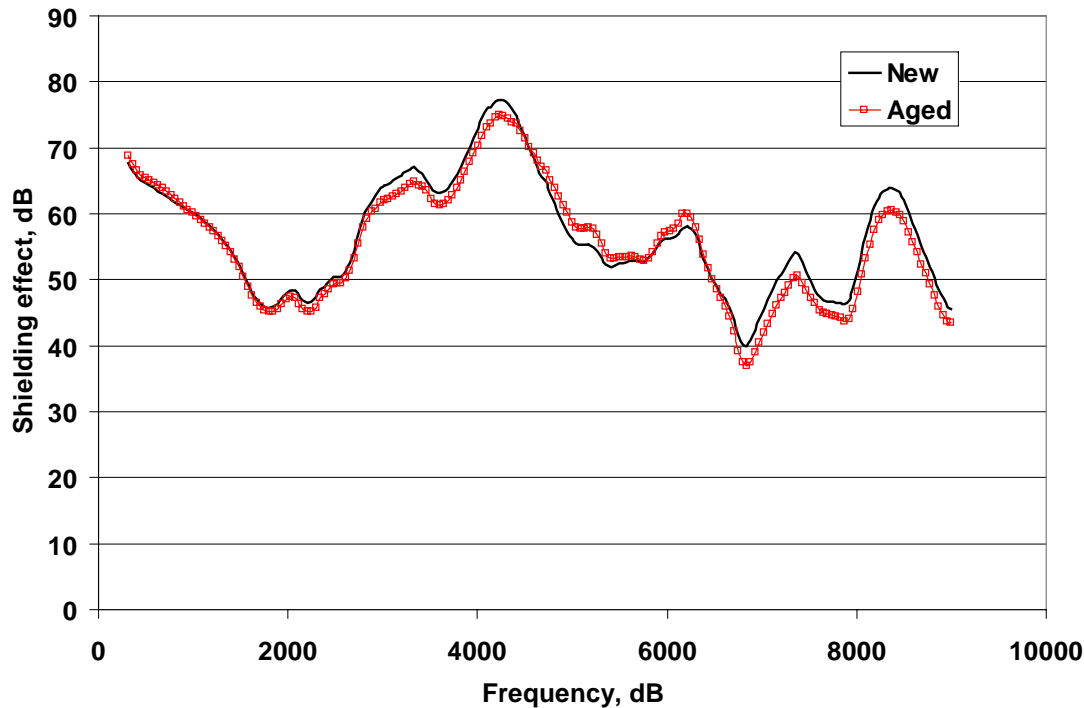
Shielding Effect



- Comparing shield cans of different metals after ageing in acid gases according to IEC 60068-2-60,2.

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Example of Ageing Effect



- Standard can of over-moulded stainless steel. Ageing in acid gases according to IEC 60068-2-60,2.

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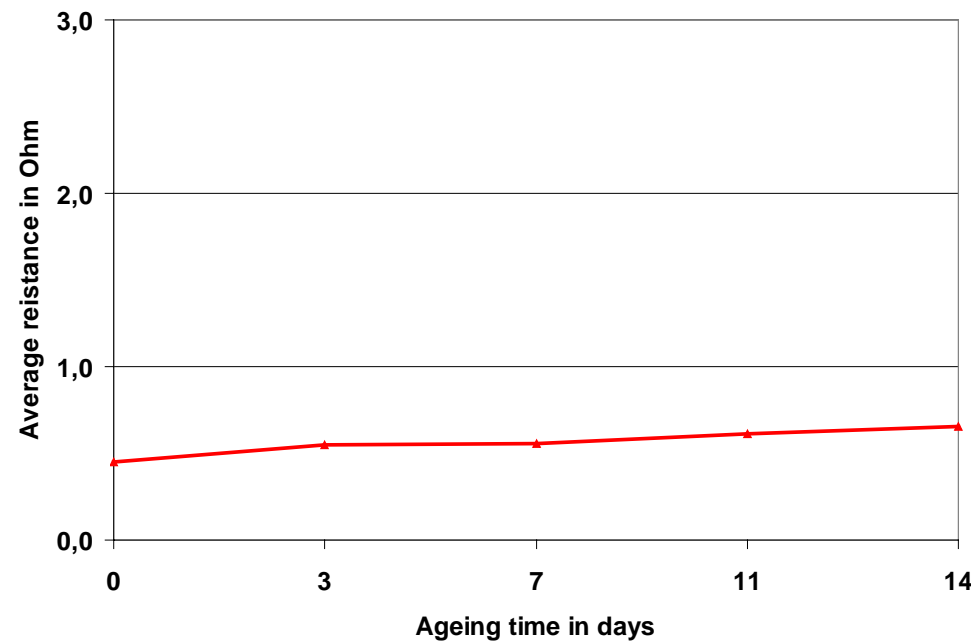
Ageing tests in customer projects

- Customers typically age and approve our product as assembled in the application.
- Test methods differs but often includes damp heat, dry heat, temperature cycling and drop test.
- The most severe condition for conductive silicone is damp heat.
- Standard test is 70 C / 97 % RH and 72 hours.
- Resistance and gasket height measured after the ageing.

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Resistance versus ageing time

- Ageing a standard shield can made of ASTM 304 and 8630 at 70 C / 97 % RH and 14 days.



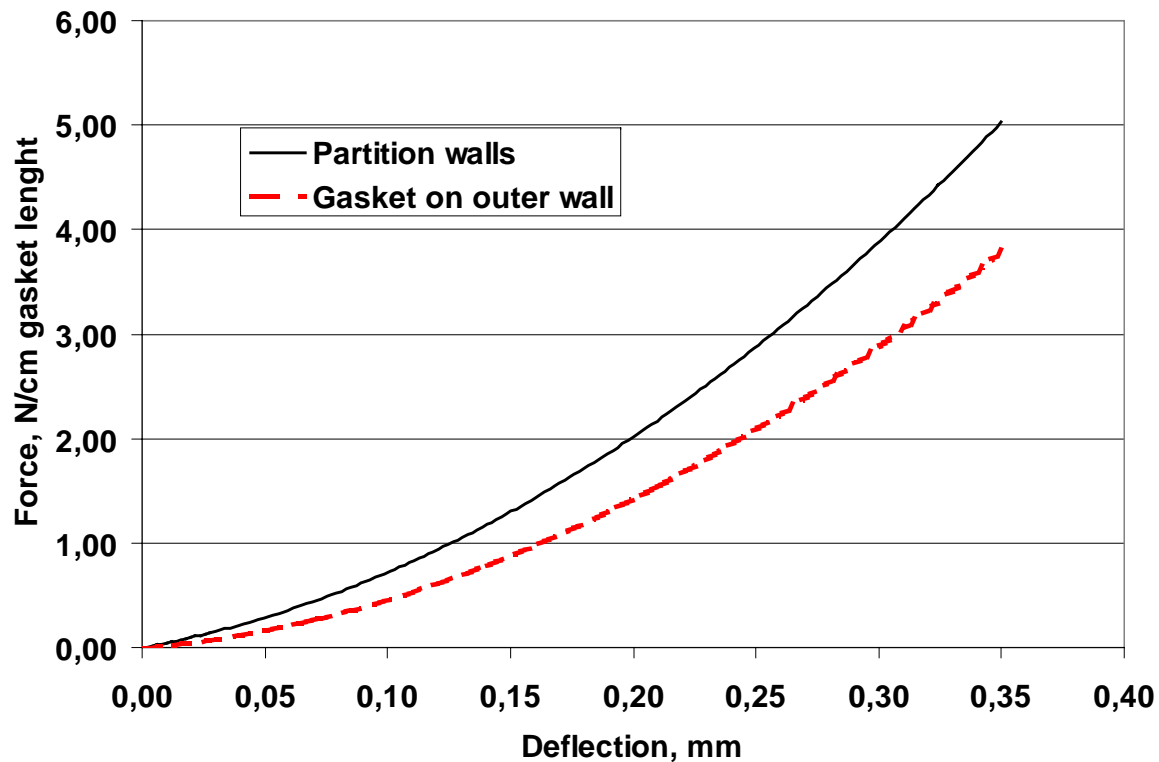
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Compression Force

- **Compression force depends on length and shape of gasket, compressed height, compression percentage, and modulus of the silicone.**
- **Rule of thumb is 2-3 N/cm and a relaxed force of 75% of initial force.**
- **The force can be predicted by FEM or measured directly on gasket.**
- **A material model can be sent on request.**

Initial Compression Force

- Measured on a shield can standard gasket



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The Production Process

■ Metal can preparation

- Deep drawing from sheet metal, washing, dimensional inspection, delivery to factory, priming

■ Rubber mixing

- Mixing of silicone, silver and additives. Test volume resistivity and shore hardness.

■ Over-Moulding

- Over-moulding, ink marking and post-curing. Inspection of resistance and appearance.

■ Deflashing and packaging

- Deflashing and 100% inspection, packaging, visual sample inspection, delivery.

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Specifications

- **In each application it is important to define demands and specifications on**
 - Dimensional tolerances
 - Electrical resistance
 - Visual requirements
- **Verification of electrical properties by measuring resistance “as assembled” on a segmented PCB. Correlate with shielding performance of complete phone to find specification.**

Cosmetic Requirements

- High cosmetic requirements difficult to achieve due to primer and high clamping force.
- Special areas with requirement must be identified early in the project.
- High strength metal, matt surface, tray handling, allowing flash on inside may help to meet requirements on a moderate level.
- For strict requirements a label or adhesive tape may be needed to cover visible area.

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Scrap and Recovery

- The shield cans contains steel, silicone rubber, silver and glass.
- No banned or restricted chemicals.
- Scrap can be deposited as normal waste.
- Gasket could be removed for silver recovery. This is not economical today.
- We suggest metal recovery by melting. Traces of silica and silver can be handled as normal impurities.
- Frames can be sent for energy recovery.

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Silicone moulding for base stations ?

- **Holders already in production.**
- **Environmental sealing of aluminium covers?**
- **Plastic and metal combinations for covers?**
- **Conductive frames for shielding of large covers?**

Assistance

- Our experts will gladly assist our customers to design the best shield for each application.
- One method is to send a first CAD drawings and allow us to design and add the gasket.
- General information of www.tennmaxusa.com

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