Conductive and Shielding Solutions

SEALS, GASKETS AND COMPONENTS TO ENHANCE SAFETY

Grounding in today's aircraft

The importance of electrical shielding

As aircraft utilize more advanced sensors, electronics, and wireless technologies, it is vital that aircraft engineers and designers address electromagnetic interference (EMI) including Radio Frequency Interference (RFI). This ensures critical systems, such as for flight control and navigations, function correctly at all times.

The sources of EMI / RFI on aircraft are numerous. They include the plane's multiple electrical systems, as well as extreme weather events, like lightning strikes and solar flares. Protecting aircraft is becoming more challenging as composites replace metals to save weight and improve fuel economy, while reducing costs and maintenance.

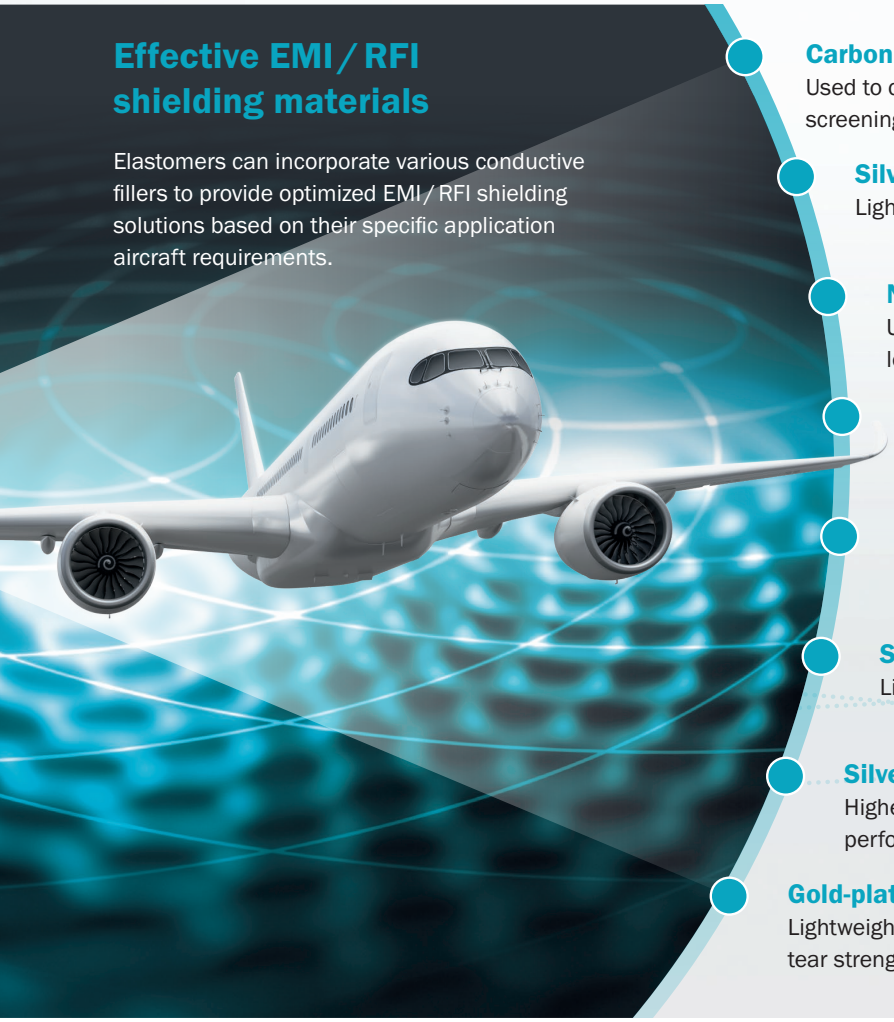
Shielding in increasingly composite aircraft

Metal airframes allowed designers to take advantage of the natural Faraday cage they formed to protect sensitive equipment. Though traditional composites and polymers are not conductive, electrical conductivity can be provided to composites by adding a copper-aluminum mesh or an expanded foil.

In addition to the airframe, other components, such as seals and gaskets, play a vital role in overall system protection. For these, Trelleborg Sealing Solutions Aerospace develops unique electrically conductive materials for key vulnerable areas of the plane. This is achieved by working with engineers to combine the right fillers with the best elastomers to tailor EMI / RFI to each plane's unique needs.

Effective EMI / RFI shielding materials

Elastomers can incorporate various conductive fillers to provide optimized EMI / RFI shielding solutions based on their specific application aircraft requirements.



Carbon Black

Used to dispel static charge or for radiofrequency screening demonstrating high tensile strength.

Silver-coated Aluminum

Lightweight additive used for corrosive environments.

Nickel-coated polyester

Used on seals that require flexible applications and/or low friction surface finish.

Nickel-coated Graphite

Used in moderately corrosive environments and preferred choice for flange gaskets.

Silver-coated Nickel

Non-magnetic additive used in corrosive environments.

Silver-coated glass

Lightweight and compatibility with most alloys.

Silver

Highest shielding effectiveness and conductive performance.

Gold-plated molybdenum knitted scrim

Lightweight reinforcing layer increasing tensile and tear strength.

Improved performance and safety

Trelleborg Sealing Solutions Aerospace products improve performance and ensure safety in nearly every part of a plane. We provide a range of solutions that support the EMI / RFI protection systems on aircraft. They feature in mission critical applications susceptible to interference, from airframes to engines and actuators to controls.

Standards and Certifications:

Trelleborg Sealing Solutions products meet all relevant aerospace standards and certifications.

- AS9100
- FAA TSO/C-150
- ISO 9001-2015
- ISO 14001
- MIL DTL-83528
- OHSAS 18001

Actuators

Actuators control the flight control surfaces, and as they are at the extremities of the plane, they are subject to electrical interference in storms. Trelleborg has developed conductive seals and bearings for these applications.

Key products: Slydring® & VL Seal

Antenna & Radar

An antenna is prone to lightning strikes and interference during electrical storms. It is, therefore, vital that they incorporate EMI / RFI protection.

Key products: Conductive elastomer gasket, conductive painting, metallic protection for antenna & anti-collision radar, weather radar / probe, detection sensor

Onboard computers

Modern aircraft rely on computers for takeoff, flight, and landing, and control the cabin environment. Within electronic control units, conductive seals and gaskets prevent interference, ensuring safety.

Key products: Conductive molded or overmolded elastomer components for cockpit control systems, sensitive avionic components, cabin systems, navigation & flight control systems, cockpit radios and avionic connectors

Smart interiors & WIFI

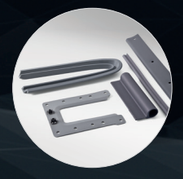
A trend toward smart cabin designs on the latest aircraft, transforms the experience of both passengers and crews. Smart ecosystems allow components to be digitally managed and controlled with touch or voice commands, from lighting to seating and even lavatories.

Key products: EMI / RFI gasket and seals

Airframe

Airframe seals are typically used for the aerodynamic sealing of doors, windows, ailerons, spoilers, canopies, hatches, and panels. Conductive fabric-reinforced airframe seal solutions offer low friction and good abrasion resistance characteristics.

Key products: Reinforced conductive airframe seals with EMI / RFI properties



Engine

Within the engine, numerous electronic controls are tightly packed in a high-temperature environment.

Key products: Reinforced conductive seals with EMI / RFI properties, metal seals

Electronics Bay

Critical to managing the aircraft, the electronics bay is jam-packed with cabling, sensors, and controls. Multiple seals and gaskets are used in the various systems and to help provide EMI / RFI shielding, these can be produced in conductive materials.

Key products: Extruded conductive & connector gaskets for electronic bay doors

Conductive Seals and Bearings for actuation systems

Trelleborg Sealing Solutions Aerospace offers a unique range of conductive polytetrafluoroethylene (PTFE) based materials that can be used in aircraft hydraulic and mechanical systems. Suitable for virtually all of our well-proven hydraulic seals and bearing designs, the compounds ensure leakage control and wear resistance, while providing effective contact between metallic parts even under dynamic conditions. This eliminates pitting damage from electric discharges.

Proven performance

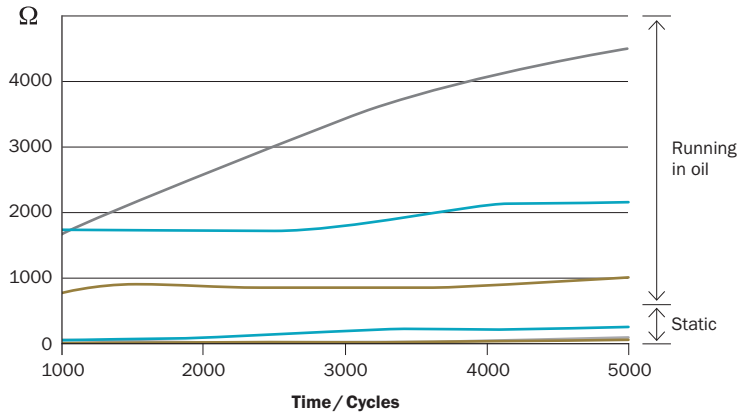
Two of these PTFE-based materials are Turcon® MC1 and Turcon® MC2. To prove the electrical conductivity of these, the compounds underwent significant testing in Trelleborg's in-house laboratories, including in a specialized test rig that simulated real life conditions. Results showed that Turcon® MC1 and Turcon® MC2 had a dry contact resistance that was negligible (highly conductive), even with low contact pressure. When running in oil, resistance was also low, and conductivity was therefore high.

More than just a product

At Trelleborg Sealing Solutions Aerospace, we support our customers from concept to delivery and beyond.

In contrast to other suppliers in the industry that only provide basic parts and inventory services, we have a comprehensive approach to the aerospace aftermarket and the maintenance repair and overhaul (MRO) segment, using a model consisting of five major service areas. This model provides maximum efficiency and large benefits to the customers with local support globally.

Enhanced Services | **Logistics** | **Handling** | **Hands-on Support** | **Engineering**



Electric Resistance during Slydring® test measured on test rig

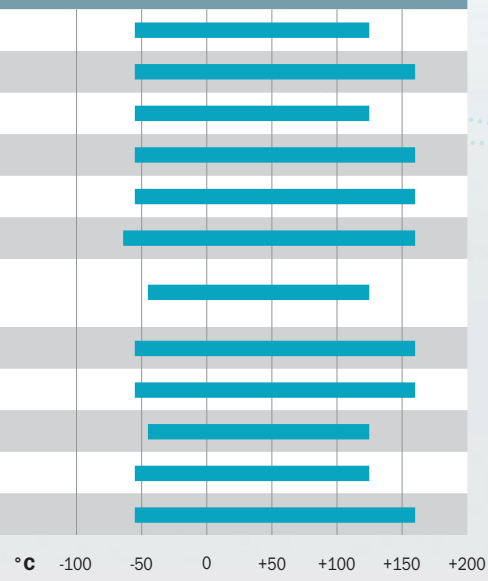
Turcon® T29
High-filled traditional carbon fillerd material

Turcon® MC1
Medium-filled material for dynamic applications providing medium to high conductivity

Turcon® MC2
High-filled material for dynamic applications providing high conductivity

Conductive Elastomers to MIL-DTL-83528

Type	Conductive Elastomers	Shielding Effectiveness 20 MHz - 10 GHz (min. dB)	Continuous Use Temperature (°C)
A	Silver plated, copper-filled silicone	110 dB	
B	Silver plated, aluminum-filled silicone	100 dB	
C	Silver plated, copper-filled fluorosilicone	110 dB	
D	Silver plated, aluminum-filled fluorosilicone	90 dB	
E	Medium durometer, pure silver-filled silicone	110 dB	
F	Pure silver-filled fluorosilicone	110 dB	
G	Silver plated, copper-filled silicone, expanded copper foil reinforced	110 dB	
H	High durometer, pure silver-filled silicone	110 dB	
J	Low durometer, pure silver-filled silicone	80 dB	
K	High durometer silver plated, copper-filled silicone	110 dB	
L	Silver plated, nickel-filled silicone	100 dB	
M	Silver plated glass-filled silicone	100 dB	



Trelleborg is a world leader in engineered polymer solutions that protect essential applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way.

Trelleborg Sealing Solutions is a leading developer, manufacturer and supplier of precision seals, bearings and custom-molded polymer components. It focuses on meeting the most demanding needs of aerospace, automotive and general industrial customers with innovative solutions.

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