

Fabric Over Foam Technology: A Trusted Solution for EMI Shielding and Environmental Protection

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In today's industrial landscape, engineers and designers across various sectors face increasing challenges to protect sensitive electronics from electromagnetic interference (EMI) while ensuring long-term environmental durability. As industries continue to innovate rapidly, the complexity of EMI issues grows, affecting everything from signal integrity in telecommunications to safety-critical systems in automotive and aerospace.

For nearly 40 years, Schlegel Electronic Materials, the pioneer and global leader in fabric-over-foam technology, has delivered trusted, high-performance solutions designed to meet the rigorous demands of modern engineering. Fabric-over-foam gaskets (Fig. 1), with their unique combination of flexibility, compression, and shielding performance, stand out for applications requiring balanced performance.



(Fig. 1)

The Fabric Over Foam Advantage: Addressing EMI and Environmental Challenges

Fabric-over-foam gaskets are a go-to solution in industries requiring consistent EMI shielding and maintaining environmental seals. Unlike traditional gasket materials, fabric over foam combines a conductive outer layer with a resilient foam core, allowing flexibility and compressibility without sacrificing performance. This unique construction provides both EMI attenuation and physical durability, essential for industries where equipment undergoes high vibrations, thermal cycling, or repeated compressions.

Effective Solutions for Industry Challenges Using Conductive Foam

- **EMI Shielding Across Varying Frequencies:** As devices and equipment handle a broad spectrum of frequencies, maintaining effective EMI shielding across these bands becomes crucial. Many materials may perform well at one frequency range but degrade at others. High-quality fabric over foam gaskets, like those produced by Schlegel, offer consistent shielding effectiveness across a wide range of frequencies, from MHz to GHz, ensuring comprehensive protection.

- **Durability in High-Vibration and Mechanical Stress Environments:** Electronics and enclosures in industries such as automotive, aerospace, and industrial equipment frequently endure high vibrations and mechanical stresses. Standard gaskets often suffer from wear, compromising their EMI shielding capabilities. Schlegel's fabric-over-foam technology provides resilience, withstanding repeated compressions while maintaining EMI attenuation. Combining a conductive fabric with a compressible foam core ensures the gasket conforms to the surface while retaining its shielding performance.
- **Corrosion and Environmental Resistance:** In industries where equipment is exposed to harsh environmental conditions—such as corrosive elements, extreme temperatures, or humidity—gasket materials must resist degradation. Schlegel addresses this by utilizing specialized protective coatings on all its fabric options, prolonging the material's lifespan and performance in corrosive or demanding environments.

Conductive Fabrics: Tailored Solutions for Specialized Applications

Schlegel Electronic Materials offers a comprehensive range of conductive fabrics to meet specific performance needs. When integrated into the fabric over foam gaskets, the conductive fabrics provide critical EMI shielding while addressing various environmental and operational challenges. Below is an overview of the high-performance fabrics they offer:

1. NiCu-C22

The NiCu-C22 is a nickel copper-plated polyester ripstop fabric engineered for superior strength and flexibility. The ripstop weave minimizes tear propagation, making it an excellent choice for high-vibration applications. Schlegel's proprietary protective top coating enhances its high conductivity and mechanical durability, ensuring long-lasting EMI protection and resilience in indoor and outdoor environments. This fabric is often used in telecommunication enclosures and industrial control systems where reliability is paramount.

- **Material:** Nickel-Copper plated polyester ripstop fabric
- **Top Coating:** Urethane
- **Shielding Effectiveness:** 95.76 dB (Mil DTL 83528C)
- **Surface Resistivity:** ≤ 0.08 ohms/sq

- Contact Resistance: 0.2 Ohm-inch at 1 kg load (SEM LP 3001)
- Abrasion Resistance: 1,000 cycles (ASTM D3884)

The NiCu-C22 offers a robust solution for applications requiring high durability and reliable EMI shielding in industrial and outdoor settings.

2. NiCu-C70

Like the C22, the NiCu-C70 is a nickel copper-plated polyester ripstop fabric with an added focus on enhanced conductivity. Its superior conductivity across a wide frequency range makes it ideal for applications requiring higher levels of EMI shielding, such as in aerospace and military equipment. The fabric's ripstop construction and Schlegel's top coating ensure it can endure mechanical stresses while providing consistent EMI attenuation.

- Material: Nickel-Copper plated polyester ripstop fabric
- Top Coating: Acrylic
- Shielding Effectiveness: 96 dB (Mil DTL 83528C)
- Surface Resistivity: ≤ 0.066 ohms/sq
- Contact Resistance: 0.11 Ohm-inch at 1 kg load (SEM LP 3001)
- Abrasion Resistance: 1,000 cycles (ASTM D3884)

This fabric is ideal for applications requiring strong mechanical durability and high EMI shielding.

3. NiCu-C12

A plain weave fabric, the NiCu-C12 offers a smooth, uniform surface for superior compression and sealing capabilities. This nickel-copper-plated polyester fabric is particularly well-suited for applications requiring high conductivity but where space constraints or complex geometries demand a more flexible and adaptable material. Its plain weave provides enhanced flexibility, making it the material of choice for intricate or irregular enclosure designs. The C12 is often used in medical devices, where tight seals and reliable EMI shielding are critical.

- Material: Nickel-copper plated polyester plain weave fabric
- Top Coating: Acrylic
- Shielding Effectiveness: 97.4 dB (Mil DTL 83528C)
- Surface Resistivity: ≤ 0.024 ohms/sq
- Contact Resistance: 0.08 Ohm-inch at 1 kg load (SEM LP 3001)
- Abrasion Resistance: 1,000 cycles (ASTM D3884)

With maximum shielding effectiveness, low surface resistivity, and plain weave fabric, NiCu-C12 is the highest-performing option for demanding EMI shielding applications where superior attenuation is critical. It is an ideal solution for complex geometries and tight design constraints in industries like medical devices and precision electronics.

4. SnCu-C50

The SnCu-C50 fabric is a tin-copper-plated nylon plain weave option specifically designed for environments where corrosion resistance is essential. This fabric's tin-copper plating provides superior resistance to oxidation and environmental degradation in highly corrosive environments, such as marine or chemical

processing industries. With its added flexibility and Schlegel's protective top coating, the SnCu-C50 is perfect for EMI shielding and environmental sealing, especially in enclosures exposed to harsh conditions.

- Material: Tin-Copper plated nylon plain weave fabric
- Top Coating: Acrylic
- Shielding Effectiveness: 95.3 dB (Mil DTL 83528C)
- Surface Resistivity: ≤ 0.020 ohms/sq
- Contact Resistance: 0.09 Ohm-inch at 1 kg load (SEM LP 3001)
- Abrasion Resistance: 1,000 cycles (ASTM D3884)

This material is well-suited for outdoor installations or chemical processing environments where oxidation and corrosion are primary concerns.

5. Ag-C2

The Ag-C2 fabric is a silver-plated nylon ripstop material designed for exceptional conductivity and moderate tear resistance. Silver-plated fabrics are often chosen for applications requiring the highest conductivity levels, such as precision instrumentation, high-frequency communications, and aerospace systems. The Ag-C2's ripstop construction is suitable for environments with moderate physical stress. Its protective top coating enhances longevity, ensuring reliable EMI attenuation, even in less demanding environments.

- Material: Silver-plated nylon ripstop fabric
- Top Coating: Urethane
- Shielding Effectiveness: 95 dB (Mil DTL 83528C)
- Surface Resistivity: ≤ 0.5 ohms/sq
- Contact Resistance: < 1.00 Ohm-inch at 1 kg load (SEM LP 3001)
- Abrasion Resistance: 800 cycles (ASTM D3884)

The Ag-C2 fabric is designed for applications with minimal physical handling, vibration, or abrasion, where high conductivity and EMI shielding remain critical, such as in telecom enclosures, laboratory and medical equipment, consumer electronics, precision instrumentation, and cabinet enclosures in controlled environments.

Each material offers distinct advantages in terms of conductivity, shielding effectiveness, and environmental performance, giving engineers various options based on their specific application needs.

Schlegel Electronic Materials offers fabric-over-foam solutions that provide reliable EMI shielding and environmental protection, meeting the increasing demands of compact, complex devices. With excellent durability, flexibility, and corrosion resistance, Schlegel's gaskets optimize designs for industries like automotive, telecommunications, and aerospace. As a trusted global partner, Schlegel delivers high-performance solutions tailored to the toughest engineering challenges across a wide range of applications.

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