

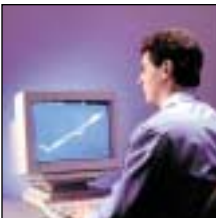


## SHOCK & VIBRATION

### CUSTOM-ENGINEERED SOLUTIONS IN KNITTED WIRE MESH

For forty years, Metex design, development, and manufacturing engineers have been producing engineered components that take maximum advantage of the unique characteristics and robust nature of knitted wire mesh. Its interlocked looped structure, which offers excellent resiliency, memory—even when subjected to high temperatures as well as high-tensile or compressive stress—and strength, make knitted wire the ideal choice in materials when both performance and cost are paramount.

Metex products now meet a wide range of critical needs—from providing flexible, yet durable, seals and joints to noise attenuation, thermal insulation, and filtration—in some of the most demanding industrial applications and environments.



Complete in-house design, R&D, and test facilities



Flexibility in manufacturing for JIT requirements

## Control Vibration and Shock Under the Most Demanding Environmental Conditions with Knitted Wire Mesh

The environments in which equipment must often operate—oil, water, ozone, corrosion, and temperature extremes—are as critical to designing materials and assemblies that isolate shock and vibration as factors such as space limitations, shock loading capability, weight, radiation, and surface friction.

As a result of its interlocking loop construction—which couples resiliency with high damping characteristics and nonlinear spring rates—Metex knitted wire mesh offers unique properties for absorbing shock and vibration. It also provides dramatically improved performance in hostile environments. Each loop acts as a small spring when subjected to compressive loads, and will immediately resume 90% of its original shape when the load is removed.

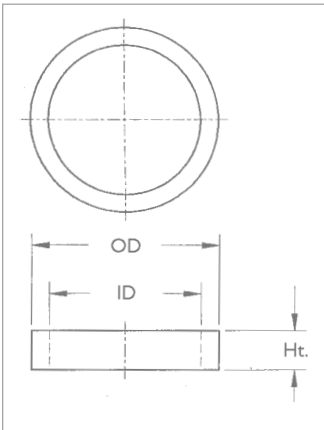
Knitted wire mesh, in a compressed form, can handle shock loadings as high as the yield strength of the material itself. In fact, it is not uncommon for a one-inch-thick disc to absorb up to 100,000 pounds of loading—a level not obtainable with any other fabricated material. Loadings may be in any direction. Knitted wire mesh is also versatile: additional resiliency, as well as reduction of surface friction, can be obtained by knitting plastic fiber in parallel with metal, in which case the metal wire acts as a structural support and binder for the plastic.

### Proven performance in shock and vibration damping

Knitted mesh has a distinct advantage in its ability to withstand hostile environments over other materials such as rubber, plastic, cork, and felt. By proper selection of the material or combination of materials, it is possible to provide vibration or shock control in corrosive atmospheres or at ultrahigh or cryogenic temperatures, as well as radioactive, dirty, oily, and other extreme conditions.

Knitted mesh also offers other environmental advantages. Since the knit contracts within itself to take up the expansion of the metal, the coefficient of thermal expansion is not a factor—the resiliency of the knit allows for expansion and contraction without the subsequent danger of the support separating from, or pinching, the equipment it protects.





### PRODUCT BENEFITS

- Resistance to corrosion and high temperature
- Wear resistant
- Excellent strength
- Resistant to melting
- High degree of resiliency—product maintains shape over a long period of time



The interlocking loop construction of knitted mesh provides the resiliency required for vibration damping

## Knitted Wire Mesh—Providing Extra Protection from Shock and Vibration Damping in the World’s Most Demanding Industrial Environments

Not only does knitted wire mesh provide superior performance—with an extra measure of protection against shock and vibration—but it can be fabricated from any material that can be drawn into a wire form. The most common knitted materials are stainless steel, copper, aluminum, and Inconel.

An assortment of fibers, plastics, and other materials can also be combined with metals to provide specific, desired damping or environmental characteristics. In addition, bulk material may be flattened, calendared, corrugated, wound, or compressed to enhance its properties for specific applications. The density of the knit may also be controlled from 10 to 70%—permitting constructions of widely varying compression characteristics.

The versatility in selection of materials and their fabrication make knitted wire mesh an ideal solution for an extremely wide range of demanding industrial applications.

### Advantages

Metex knitted wire mesh products provide a number of significant advantages over other shock and vibration damping materials:

- Flexible support offers variations of alignment, flame resistance, expansion and contraction, and corrosion control.
- Offers more durability with less effect from the environment.
- Wide range of materials can be used to control not only acoustical properties, but aging processes.
- Isolation pads can withstand more weight and maintain its resiliency without deterioration.
- Will reduce wear and tear on critical piping or delicate tubing on aircraft, marine, or other transit equipment when used as clamps for retainers.
- As bumper pads, can add extended life to pneumatic tube carriages, plus reduce impact noise.

### Applications

Applications for Metex knitted wire mesh include vibration and shock control for:

- **Engine mounts**—cars, trucks, boats, recreation vehicles (camper trailers), electric motors, auxiliary motors, and aircraft
- **Vibration pads**—Machinery, floating slabs and pipes
- **Mounts**—Electronics, tubing, hydraulics, aircraft, and marine
- **Bumper pads**—Pneumatic tube systems, coin machines for bank, ball screws, and steering columns
- **Clamps**—Tubing, tongs and furnace clamps (fingers)
- **Exhaust Systems**—Catalytic monolith supports

## Applications

### ■ AUTOMOTIVE

**Challenge:** In the early 1970s, the automotive industry needed a mechanical support for the brittle ceramic honeycomb substrate used in exhaust system catalytic converters.

- The support was used to fill a gap of approximately 4 mm between the ceramic monolith substrate and the metal shell in which it was housed. However, since the rates of expansion and contraction of the metal shell and ceramic element are different, the clearance space changed whenever the engine ran or was shut off.
- The mechanical support had to compensate for this changing clearance space while protecting the substrate from road shock. It also had to withstand temperatures as high as 650° C (1200°F), wide temperature differentials and corrosive exhaust gas emissions. The ceramic felts and other fiberglass materials previously employed lost their resiliency and became permanently compacted well before the service life required of the converter. As a result, they lost their supportive power or broke up, causing destruction of the substrate.

**Solution:** To solve this problem Metex developed a knitted wire catalyst substrate support, from resilient, knitted metal. The knitted metal not only supports the monolith and compensates for the thermal expansion of the assembly, but also protects the ceramic honeycomb from mechanical shock during normal and abnormal driving. To date, over 25 million of these mounts have been manufactured by Metex Corporation.

### ■ AIRCRAFT

**Challenge:** The aircraft industry required tubing and harness clamps which could effectively dampen the high-frequency engine vibrations experienced during taxi, takeoff and in-flight operations—yet prevent them from affecting fuel, hydraulic, and electrical lines.

It was also important that the clamps have low surface friction so any linear movement would not cause wear at the holding point—which could lead to in-flight failures.

**Solution:** Metex solved the problem by developing a knitted metal pad that is spot-welded to the inside of the clamp. Due to high temperature differentials—and the potential of attack from ozone, hydraulic fluid, and jet fuel—stainless steel and Inconel were specified. Since the surface friction of the knitted metal is relatively low, it allowed for lateral motion of the assembly with full protection from the wear and vibrational stresses. The use of knitted metal also allowed a degree of electrical grounding through the all-metal mount.

### ■ MARINE

**Challenge:** Electronic equipment mounted aboard ships or moving vehicles requires mounting devices that are lightweight and can provide protection from high levels of vibration and shock over extended periods.

**Solution:** A series of Metex-developed shock mounts now provide a resilient cushion to protect sensitive equipment. The high damping qualities of the knitted metal cushions also allow faster reduction of vibration without severe rebound.

Exposure to oil, saltwater spray, solvents, dust, dirt, or temperature extremes cause no degradation of the unit's performance.

### ■ POWER GENERATION

**Challenge:** In nuclear power plants, pipes suspended in pipe hangers must be protected from vibration.

**Solution:** Many utilities have solved the problem by using a flat pad of knitted metal, designed by Metex. The 150 mm wide by 230 mm long by 12 mm thick pads are placed inside the hanger. Pipes as large as 765 mm in diameter have been protected in contaminated areas. The knitted metal has been impervious to radiation degradation.



Automotive exhaust air-gap pipe ring—the inherent resiliency and high-damping characteristics of knitted wire mesh provide superior performance



Engine clamp—geometry and diversity are not limited to round, square or rectangular cross sections



## Metex Knitted Wire Mesh Products Solve Problems Cost Effectively

Metex knitted wire mesh is manufactured from an "endless" wire that is formed into loops and subsequently networked, providing elasticity and resilience not found with woven wire or powdered metal products.

The diversity and versatility of wire mesh enables Metex to produce products for a wide variety of applications, including:

- Seals
- Breathers
- Coalescers
- Gaskets
- Heat Shields
- Navin Rings
- Catalytic Converter Support Mesh
- Heat Wicks
- Noise Attenuators
- Mufflers
- Air Filters
- Electronic Shielding
- Ball Joint Seal Systems
- Air Gap Rings
- Filters
- Shock Absorbers
- Protective Coverings
- Exhaust Seals
- Catalytic Converter End Rings
- Flame Arrestors

Our **Knitted Wire Shock & Vibration Products** continue a longstanding Metex tradition of integrating the right designs, materials, and manufacturing methods to meet customer needs for optimal performance at lowest possible cost.



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