CONDUITS

Sunflex Conduits for Hi-Reliability and Harsh Environments

SUNBANK
Connection Technologies

Typical applications

Aerospace

Defense

Industrial

Marine

Communication

Off-Road

Features & Benefits

EMI/RFI /HIRF

Shielding Protection

Metallic braided shielding over the flexible conduit provides excellent EMI/RFI/HIRF protection.
Qualified on major landing gears.

ROBUST

Conduit Protection

Synthetic braided coating available for abrasion protection purposes.
PTFE inner coating avoid wire chafing and arcing.
Selective protection possible.

HARSH ENV.

Environmental Wire Protection

High temperature and fire-resistant overbraids made of various aerospace grade materials.
Jackets to protect the wiring system from exposure to chemicals.
Thermoplastic liners that offer crush resistance and flexibility.

FLEXIBLE

Easy and Versatile Solution

Wires are directly inserted in the conduit for protection and routing.
Prolonged movements resistance as well as easy change of the inside wiring.

PLUG & PLAY

Turnkey Solutions

Many adapters and custom made conduit assemblies available.
Robust multi-way transitions.
Wide range of connectors self-locking.

For over 60 years **SUNBANK** has been supporting the interconnect market by designing highly reliable connector accessories and flexible conduit assemblies for harsh environments.

We proudly provide solutions worldwide for Aerospace, Defense, Marine and Industrial power and signal interconnect markets.

Custom made cable routing solutions

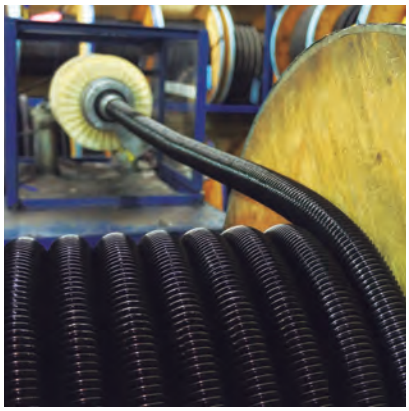
SUNBANK's "Sunflex" flexible conduits enable a repairable and static/dynamic cable routing, while protecting the wires from mechanical and chemical stresses.

Sunflex conduits result of various superposed physical layers, each of the layers adding specific properties and functions to the routing.

Sunflex conduits can be either supplied in linear form, unwired or as a fully wired assembly. In this case, we can provide you the wiring adaptors and even the connectors for a "Plug and Play" solution.

SUNBANK has proven expertise in providing high performance conduit systems which are ideal for harsh environment applications.

Liner extrusion



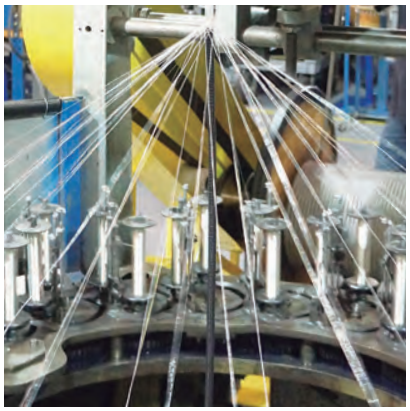
As a complement capability to our conduit assembly product line, **SUNBANK**'s liner extrusion process offers flexibility with a variety of plastic and fluoropolymer material options that include:

- ETFE (-65°F to +310°F)
- PFA (-95°F to +500°F)
- FEP (-95°F to +400°F)
- PTFE (-95°F to +500°F)
- PEEK (-76°F to +392°F)

Available in a wide variety of different diameters, colors and hardness; we have an experienced engineering team available to help choose the right option for your end application.

After the extrusion, a light weight metalic and/or textile braid layers can be added for electrical requirement and to enhance conduit tensile strength and protection.

Braiding



From stainless steel, tin-copper, nickel, bronze to Dacron®, **SUNBANK** has exceptional experience in braiding different materials, sizes and shapes which are then incorporated as a protective physical layer within our conduit product series.

Metallic braids integrated into cables and conduit o fer benefi cial functions of EMI/RFI shielding, improved signal integrity, strength and easy crimping or solder termination to a connector or backshell.

SUNBANK has a fully integrated process composed of bobbin winders and braiders. This provides manufacturing flexibility and options to offer multiple braid layer configurations and custom solutions to accommodate your most demanding design.

Assembly

SUNBANK has state-of-the-art and fully integrated assembly capabilities dedicated to providing quality and value-added solutions to our customers.

Built to the highest standards and including certification by AS9100, we have a vertically integrated operations model.

As part of the Sunflex brand, **SUNBANK** has great expertise in providing high performance conduit systems which are ideal for harsh environment applications that include:

- Chemical exposure (oils, solvents, etc.)
- Vibration
- High moisture environments
- Sunlight exposure

Material properties

Liner

The first consideration in the selection of a conduit liner must be the material properties. This chart details the five basic fluoropolymer or thermoplastic, elastomer materials that form the basis of the Sunflex conduit system.

Material Property	PFA (P***00A-)	PTFE (T***00A-)	FEP (F***00A-)	ETFE (E***00A-)	PEEK (G***00A-)
Min./Max. Temperature	-95°F / +525°F	-95°F / +500°F	-95°F / +400°F	-65°F / +310°F	-76°F / +392°F
Tensile Strength	3000 psi	2500 psi	2500 psi	5000 psi	7000 psi
Elongation	250%	175%	200%	100%	100%
Specific Gravity	2.15	2.15	2.15	1.70	1.26
Dielectric Strength	12,000 V	12,000 V	12,000 V	12,000 V	12,000 V
Volume Resistivity	10^{18}	10^{18}	10^{18}	10^{16}	10^{12}
Water Absorption	0.03%	0.01%	0.01%	0.02%	0.03%
Heat Aging	2,000 hours at 525°F	2,000 hours at 525°F	2,000 hours at 430°F	2,000 hours at 350°F	2,000 hours at 464°F
Solvent Resistance	No swelling, tackiness or weight change				
Flammability	Non-burning				
Fungus Resistance	Does not support fungus growth				

Environmental jacket

Material Property	Hypalon (Chlorosulfonated Polyethylene)	Neoprene (Polychloroprene)	EPDM (Ethylene Propylene Diene Monomer)	Viton
Temperature Range °F	-60° to +300°	-60° to +250°	-90° to +293°	-40° to +39°
Specific Gravity	1.18	1.25	.86	1.80
Weight LBS/Cubic Inch	.043	.045	.031	.055
Abrasion Resistance	Excellent	Excellent	Excellent	Excellent
Wear Resistance	Good	Good	Good	Good
Flame Resistance	Good	Good	Good	Good
Exposure to Sunlight	Excellent	Excellent	Excellent	Excellent

Chemical Resistance	Hypalon (Chlorosulfonated Polyethylene)	Neoprene (Polychloroprene)	EPDM (Ethylene Propylene Diene Monomer)	Viton
Aliphatic Hydrocarbons	Good	Good	Good	Excellent
Aromatic Hydrocarbons	Fair	Fair	Good	Excellent
Ketones etc.	Poor	Poor	Good	Poor
Oil & Gasoline	Good	Good	Good	Excellent

Conduit size

To determine conduit size required

A wire bundle may contain all the same diameter wires or a mixture of several different diameters.

It is not sufficient to know the gage of wire as this only gives the diameter of the conductor. The overall diameter over the insulation and or braids, etc., must be established by reference to the appropriate wire specification.

Standard recommended cable bundle to conduit fill is 80%. Consult us for detailed calculation method.

Electromagnetic compatibility (EMC)

The electromagnetic compatibility of a system is determined by the system's integrity and functioning compatibility in an environment of electromagnetic radiation. This electromagnetic radiation, known as EMI (electromagnetic interference), is generated by two primary sources: natural and man made. Natuaral EMI stems from thunderstorms, solar emissions, wind storms, lightning discharges, etc...

Man made EMI may be intentional or unintentional. Unintentional EMI arises from the use of electric motors, ignition systems, generators, faulty electrical systems, etc... Intentional EMI is usually offensive, and is generated by radar and radio jamming systems, or nuclear explosions (which create a form of EMI known as EMP: electromagnetic pulse).

To safeguard an electrical system or circuit, a barrier or shield must be placed between it and the source of interference. With wiring harnesses, this shield can take the form of a metallic conduit, usually brass, with suitable fittings attached to the conduit and connector. Such a system effectively shields the enclosed wiring by receiving the interference and directing it harmlessly to ground. While effective, this system will not stand high vibration or constant flexure, as the conduit fatigues and breaks apart. This reduces it shielding ability to almost zero.

Although Sunflex offers this type of metal conduit for relatively static applications (MIL-C-13909), we recommend our convoluted plastic conduits for high vibration, flexure applications. Effective shields are provided by the use of overbraids of a variety of materials to give the maximum shielding for each specific application. These conduits have an extremely high flexure life and will withstand continuous high frequency vibrations with no ill effect.

There are two primary methods for measuring the electromagnetic compatibility (EMC) of a wiring harness.

1. Shielding Efficiency
This measurement is performed by using the wiring as an antenna to emit radiation, and measuring that radiation. Then a shield is applied over the wire, and the radiation (or field strength) is remeasured. The results are expressed on a logarithmic scale, in decibels as:

$$\text{Shielding efficiency} = 20 \log \frac{\text{Field strength before shielding}}{\text{Field strength after shielding}}$$

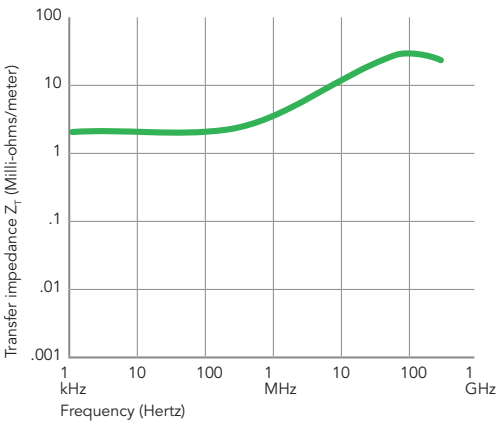
2. Transfer Impedance (Z_T)
This is the ratio of the voltage induced on the inner surface of a shield system, to the current flowing on the exterior surface. The results are expressed as ohms per meter.

$$Z_T = \frac{\text{Voltage interior}}{\text{Current exterior}}$$

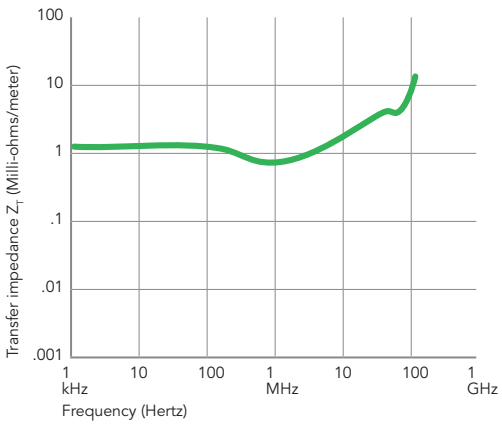
Of the two methods, the transfer impedance method is preferred. It is more positive and not susceptible to other variants (connecter quality, screenroom efficiency, etc...). Transfer impedance testing methods are defined in MIL-C-85485.

The graphs below show average transfer impedance for a selection of standard Sunflex braid patterns:

Single layer braid or tinned or nickel, copper wire .0063 Dia.



Double layer braid of tinned or nickel, copper wire .0063 Dia.



Conduits for Extreme Environments | Complete Assemblies Offer

Wall Mount Adapters

- Flange
- Bulkhead and feedthrough
- Connector fittings

Transitions

- Multi-way design: T, Y, YY, X or in-line
- Provides a robust fan out in multiple direction
- Connector fittings

Custom Made Tubing

- Built to spec
- Bent or welded solution

SOURIAU Connectors

- A full range of standard and custom interconnect solutions
- Designed to withstand the harshest environments: extreme temperatures, high vibration, corrosive fluids, ...

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