AlphaWire University

Insulation and Jacket Properties

Insulation Properties

PROPERTIES	PVC	PE	PP	TFE	FEP	PVDF	TPE
Abrasion Resistance	Good	Good	Fair	Fair	Good	Good	Good
Heat Resistance	Good	Good	Good	Excellent	Excellent	Excellent	Excellent
Weatherability	Good	Excellent	Excellent	Excellent	Excellent	Good	Excellent
Flame Retardancy	Excellent	Poor	Poor	Excellent	Excellent	Excellent	Excellent
Water Resistance	Good	Excellent	Excellent	Excellent	Good	Good	Good
Acid Resistance	Good	Good	Excellent	Excellent	Excellent	Excellent	Excellent
Alkali Resistance	Good	Good	Excellent	Excellent	Excellent	Excellent	Excellent
Aliphatic Hydro. Resistance	Good	Poor	Fair	Excellent	Excellent	Excellent	Poor
Aromatic Hydro. Resistance	Poor	Poor	Fair	Excellent	Excellent	Excellent	Poor
Specific Gravity	1.16-1.70	0.91-1.26	0.890-0.905	2.13-2.20	2.12-2.17	1.75-1.78	1.16-1.20
Tensile Strength, psi	1500-4500	1500-2200	2900-4500	1000-3500	2700-3100	5200-7500	2300
Elongation, %	40-400	180-600	700	275	250-330	500	500
Volume Resistivity, ohm-cm	10^{4}-10^{16}	>10^{15}	1.5-2.8 x 10^{15}	>10^{18}	2.0 x 10^{18}	2 x 10^{14}	2.2 x 10^{18}
Dielectric Strength, volts/mil	250-500	230-1420	450-850	500	500-600	260	625
Dielectric Constant @ 60 Hz	3.2-9.0	2.28-2.50	2.50-2.75	2.0-2.1	2.1	8.40	2.8
Dielectric Constant @ 1 kHz	3.0-8.0	2.27-2.50	2.50-2.65	2.0-2.1	2.1	7.9	2.8
Dissipation @ 60 Hz	.007-0.15	0.003-0.044	0.0054-0.0070	0.0004	0.0002	0.049	0.002
Dissipation @ 1 kHz	.009-0.16	.00048-.00049	.0036-.0050	0.0001	0.0007	0.019	0.002

Insulation Properties

PROPERTIES	ETFE	NATURAL RUBBER	CSPE	POLYCHLOROPRENE	SILICONE	PU
Abrasion Resistance	Good	Excellent	Good	Excellent	Fair	Excellent
Heat Resistance	Excellent	Fair	Excellent	Good	Excellent	Good
Weatherability	Good	Fair	Excellent	Good	Excellent	Good
Flame Retardancy	Excellent	Poor	Good	Good	Good	Good
Water Resistance	Excellent	Good	Good	Excellent	Excellent	Good
Acid Resistance	Excellent	Fair	Excellent	Good	Good	Fair
Alkali Resistance	Excellent	Fair	Excellent	Good	Good	Fair
Aliphatic Hydro. Resistance	Excellent	Poor	Fair	Good	Poor	Good
Aromatic Hydro. Resistance	Excellent	Poor	Fair	Fair	Poor	Poor
Specific Gravity	1.70-1.86	1.3-1.7	1.35-1.7	1.23-1.65	1.1-1.6	1.30
Tensile Strength, psi	6500	1500-4000	1200-2200	1200-2700	1000	>3500
Elongation, %	200	300-700	300-600	300-700	100-500	540-750
Volume Resistivity, ohm-cm	$>10^{16}$	10^{13}-10^{16}	10^{12}-10^{14}	10^{11}-10^{13}	0.8-2 x 10^{14}	11 x 10^{14}
Dielectric Strength, volts/mil	500	---	500	600	100-700	330-630
Dielectric Constant @ 60 Hz	2.6	---	---	---	---	5.4-7.6
Dielectric Constant @ 1 kHz	2.6	2.3-3.0	9.0-11.0	5.0-7.0	3.0-3.5	5.6-7.6
Dissipation @ 60 Hz	---	---	---	---	---	0.015-0.046
Dissipation @ 1 kHz	0.0006	.00023-.00030	0.05-0.07	3.5	0.001-0.010	0.043-0.060

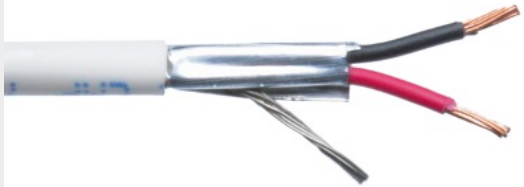
Shielding

- Is a material that is electrically conductive and surrounds a wire or cable. The shield's primary function is to limit any signal trying to escape from the wire or cable. It also inhibits external signals or interference from flowing into the wire or cable. Braids, armor and corrugated metal can also provide mechanical protection for the cable.
- There are a few basic types of shields used in the wire and cable industry today. The most popular ones are listed below:
  - **Braid shields:** Most braids are made up of either bare copper, tinned copper, or silver plated copper. Braid shields typically have a nominal coverage of 55% to 95%. Braids are typically more expensive than a tape shield, due to the slow speed of the braider, the percent coverage desired and the material used to construct the braid. They are also more difficult to terminate.

Shielding

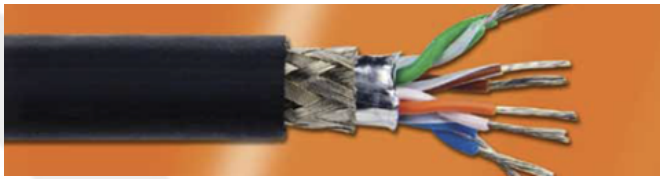
- **Spiral shields:** This is similar to a braid except that it is made up of single strands of wires spirally wrapped around a conductor or cable core. This type of braid is more flexible than a woven braid. It is also easier to terminate than the woven braid. Spiral shields typically have a nominal coverage of 95% to 98%. Spiral shields are most effective in the audio frequency range and are typically found in microphone and audio cables.

- **Tape shields:** These are made from various materials. They normally consist of a laminate of aluminum and polyester layers joined together by adhesive. These types of shields are fragile and provide little in the way of mechanical strength. The adhesive is typically a pressure sensitive solvent release adhesive. Some of the more popular ones used today are Aluminum/Polyester (AM), Aluminum/Polyester/Aluminum (APA), and Foil Free Edge (FF).

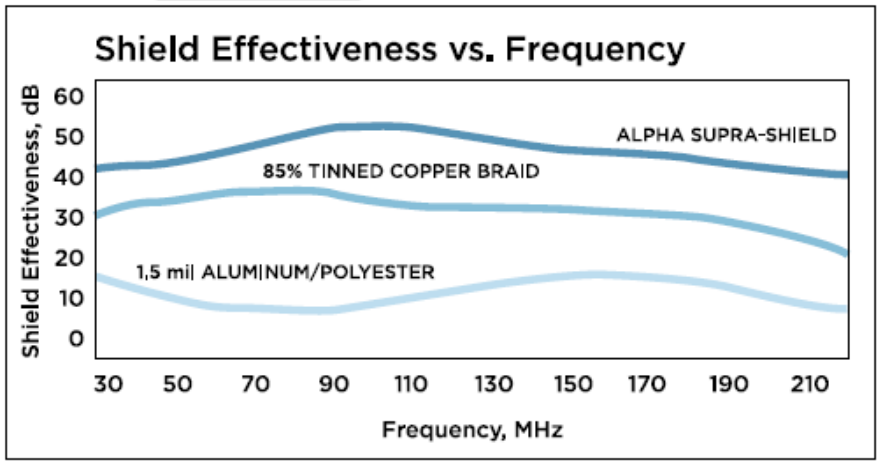


SUPRA-SHIELD®

- This is a term used by Alpha Wire to describe a combination of an aluminum/polyester/aluminum foil shield and a 70% tinned copper braid shield. This provides the **best** combination for shielding and makes the cable suitable for a wide array of applications where good EMI shielding is required.



- The following graph shows the measured Shield Effectiveness verses Frequency for a aluminum/polyester tape (1.5 mils thick), 85% Tinned Copper Braid and the Alpha SUPRA-SHIELD.



Jacket

- An outer covering that is typically placed around a group of insulated conductors, pairs, triads or other cable core components to provide mechanical protection as well as to aid in cable installations.
- The jacket physically protects the internal components of a cable, improves the cable's appearance and provides flame retardancy.
  - Protects from the environment
  - Protects from the rigors of installation

Jacket Types

- **Thermoplastic** material can be repeatedly softened and is formable into any shape when hot. Once cooled, the material becomes firm or rigid and will hold its shape.
  - Polyvinylchloride (PVC)
  - Polyethylene (PE)
  - Chlorinated Polyethylene (CPE)
  - Polyurethane (PU)
  - Thermoplastic Elastomer (TPE)
  - Modified Polyphenylene Ether (mPPE)
  - Low Smoke Zero Halogen (LSZH)
  - Fluorinated Ethylene-Propylene (FEP)
  - Tetrafluoroethylene (TFE, including ETFE and PTFE)
  - Polyvinylidene Fluoride (PVDF)
- **Thermoset** materials harden when heat is applied and can not be reshaped by reapplying heat.
  - Styrene-Butadiene Rubber (SBR)
  - Polychloroprene
  - Chlorosulfonated Polyethylene (CSPE)

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Acid Resistance	Fair	Excellent	Good	Good	Fair
Alkali Resistance	Fair	Excellent	Good	Good	Fair
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Specific Gravity	1.3-1.7	1.35-1.7	1.23-1.65	1.1-1.6	1.30
Tensile Strength, psi	1500-4000	1200-2200	1200-2700	1000	>3500
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Cables you trust. Service you deserve.

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FIT
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INDUSTRIAL™ SERIES
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