

# Composite Wire & Cable



## INTRODUCTION

Carlisle Interconnect Technologies (CarlisleIT) has developed composite insulated cables to combat the limitations associated with Polyimide and XL-ETFE and improve upon existing airframe wire designs. Our composite cables offer weight and space savings without sacrificing the mechanical and thermal performance of the wire. CarlisleIT's Tufflite<sup>®</sup> and Seamless<sup>™</sup> cables address the need for a small, lightweight, arc-resistant, general-purpose wire rated to 260 °C.

For over 20 years, our wire and cable have been tested and flown on thousands of commercial and military aircraft. Its superior smoke, flame, and toxicity performance enables it to be used safely in both pressurized and non-pressurized zones of the aircraft. The wide temperature range and overall balance of properties make Tufflite and Seamless ideal replacements for all other general-purpose wire types, both military and commercial.

## FEATURES & BENEFITS

### Excellent Temperature Performance

- » Available in 150 °C, 175 °C, 200 °C, and 260 °C
- » Superior thermal life characteristics
- » The safety of high-temperature resistant insulation in overload conditions independent of the conductor

### Superior Flammability and Smoke Generation Properties

- » Practically zero smoke generation and excellent resistance to flammability

### Excellent Resistance Arc Propagation

- » Superior resistance to wet and dry arc propagation

### Light Weight and Small Diameter

- » SLT has an approximate 5% weight savings over medium wall XL-ETFE
- » Seamless requires 15 - 20% less cross-sectional area than equivalent ETFE wire bundle

### Best Balance of Properties

- » Excellent flexibility and flex life
- » Highly resistant to hydrolysis
- » Superior abrasion resistance and cut-through performance
- » Seamless no-edge insulation allows for faster installation, less rework, and less scrap

# Composite Wire & Cable Tufflite®

## HISTORY

Developed in the 1990s, Tufflite cables are available in six cable families in sizes 26 to 4/0 AWG. They are laser markable and approved to multiple commercial aircraft platforms.

## PART NUMBERING GUIDE

Family of Wire	Temperature Rating (°C)	No. of Conductors (not used for single insulated wire)	Shield & Jacket (not used for single insulated wire)	AWG Size	Conductor Material
P/N Example: ST-260-2NJ-22N					
ST	260	2	NJ	22	N
SLT	150 °C 200 °C 260 °C	<i>Per customer request<sup>1</sup></i>	T = TCC Shield S = SCC Shield N = NCC Shield F denotes flat shield	26 to 10	T = Tin Coated Copper S = Silver Coated Copper SA = Silver Coated Copper Alloy N = Nickel Coated Copper NA = Nickel Coated Copper Alloy
TLR	260 °C		N = NCC Shield <sup>2,2</sup> S = SCC Shield	26 to 2	N = Nickel Coated Copper NA = Nickel Coated Copper Alloy S = Silver Coated Copper
ST	150 °C 200 °C 260 °C		T = TCC Shield S = SCC Shield N = NCC Shield F denotes flat shield	26 to 4/0	T = Tin Coated Copper S = Silver Coated Copper SA = Silver Coated Copper Alloy N = Nickel Coated Copper NA = Nickel Coated Copper Alloy
TLS	260 °C		N = NCC Shield F denotes flat shield	24 to 4/0	N = Nickel Coated Copper NA = Nickel Coated Copper Alloy
TLA	175 °C		N-A	8 to 4/0	A = EC Aluminum
TL	150 °C 200 °C 260 °C		T = TCC Shield S = SCC Shield N = NCC Shield F denotes flat shield	26 to 4/0	T = Tin Coated Copper S = Silver Coated Copper SA = Silver Coated Copper Alloy N = Nickel Coated Copper NA = Nickel Coated Copper Alloy

<sup>1</sup> High number of conductors need engineering review <sup>2,2</sup> Served shield

## SELECTION GUIDE

Use this table to select the wire that best fits your requirements.

Family of Wire	TL	ST	SLT	TLR	TLS	TLA
Relative Insulation Thickness	Medium	Medium	Thin	Medium	Thick	Thick
Voltage Range	600 V	600 V	600 V	600 V	600 V	600 V
Temperature Rating	150 °C / 200 °C / 260 °C	150 °C / 200 °C / 260 °C	150 °C / 200 °C / 260 °C	260 °C / 260 °C	260 °C	175 °C
Conductor Material	Copper / Copper Alloy	Copper / Copper Alloy	Copper / Copper Alloy	Copper / Copper Alloy	Copper / Copper Alloy	Aluminum
Conductor Coating	Tin / Silver / Nickel	Tin / Silver / Nickel	Tin / Silver / Nickel	Silver / Nickel	Nickel	N-A
AWG Range	26-4/0	26-4/0	26-10	26-2	24-4/0	8-4/0

## TUFFLITE® FAMILY DESCRIPTIONS

### SLT - Thin Wall, Lightweight

A thin wall, lightweight version of ST can be used in various constructions. It also has value when considered as a single conductor offering a 5% weight savings over the ST construction while maintaining the same mechanical properties. SLT is available in 150 °C, 200 °C, and 260 °C

### ST – Enhanced Medium Wall, Normal Weight

Encompasses a family of wire and cable in three temperature ratings: 150 °C, 200 °C, and 260 °C. ST is a multi-purpose normal weight wire which exhibits exceptional performance characteristics within the range of the critical parameters in airframe applications. This construction offers enhanced hydrolysis resistance and cut-through..

### TL – Medium Wall, Normal Weight

Encompasses a family of wire and cable in three temperature ratings: 150 °C, 200 °C, and 260 °C. TL is a multi-purpose normal weight wire which exhibits exceptional performance characteristics within the range of the critical parameters in airframe applications.

### TLA – Thick Wall, Aluminum Conductor

An increased wall thickness version utilizing an aluminum conductor for power feeder applications. Improved mechanical performance, including superior flexibility as compared to traditional polyimide insulated power feeder cables. TLA is rated at 175 °C.

### TLR – Metric Medium Wall, Normal Weight

Encompasses a metric family of wire and cable with a temperature rating of 200 °C and 260 °C. TLR is a multi-purpose normal weight wire which exhibits exceptional performance characteristics within the range of the critical parameters in airframe applications.

### TLS – Thick Wall, Abrasion Resistant

An increased wall version which can be utilized in applications requiring superior mechanical capabilities such as abrasion resistance and dynamic cut-through. This insulation system may be used as a reduced size and weight replacement for MIL-W-22759/5 to /8. TLS is rated at 260 °C.

# Composite Wire & Cable Seamless™

## HISTORY

Seamless and Seamless-T were first developed in 2002. The Seamless wrap PTFE tape is an insulation and cable jacket technology that offers all the advantages of a tape wrap, with the smooth appearance and characteristics of an extrusion. Seamless products meet all requirements for AS22759/80-/92 and NEMA WC27500. Seamless-T meets the requirements of AS22759/180-/192.

## ADVANTAGES

- » Weight and space savings over extruded insulation
- » Exceptional resistance to scrape abrasion
- » Exceptional laser markability
- » Exceptional hydrolytic resistance
- » Exceptional electrical arc track resistance
- » Exceptional layer-to-layer adhesion
- » Exceptional low outgassing characteristics

## SEAMLESS™ FAMILY

### Product Availability

Seamless & Seamless-T PTFE tape-wrapped products are designed for use in commercial and military aerospace applications. They are available in a variety of constructions and colors. Custom designs are available by request.

### AS22759/80-/92 Hook-up Wires

Incorporate either dual-, three- or four-layer insulation constructions with copper alloy, tin-, silver-, or nickel-plated stranded conductors.

### AS22759/180-/192 Hook-up Wires

Incorporate either dual-, three- or four-layer insulation constructions with copper alloy, tin-, silver-, or nickel-plated stranded conductors.

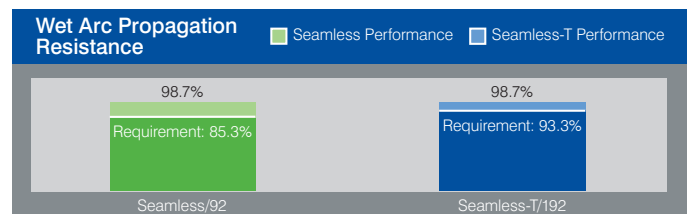
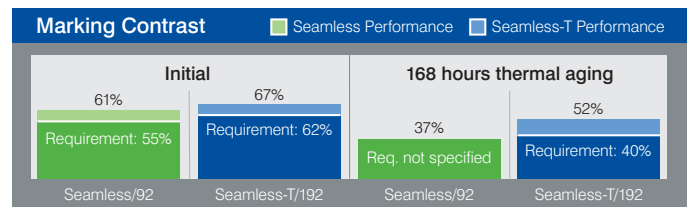
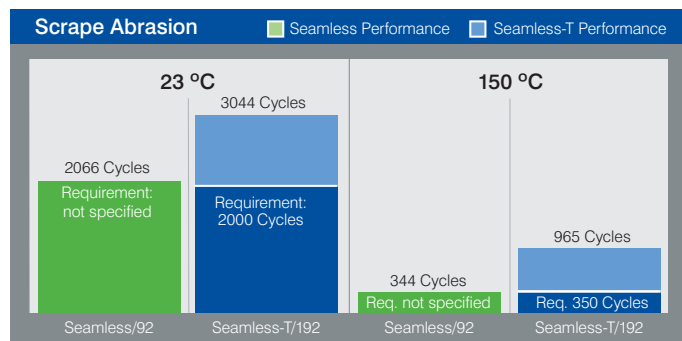
### NEMA WC27500 Cables

Incorporate from one to fifteen MIL-DTL-22759, MIL-DTL-25038 or MIL-DTL-81381 wires, plus a single or double shield and a single or double jacket.

## SEAMLESS™ COMPARISON CHARTS

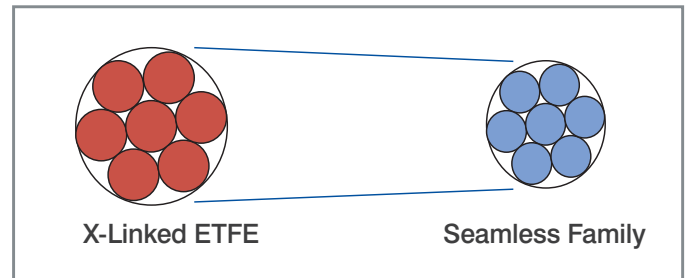
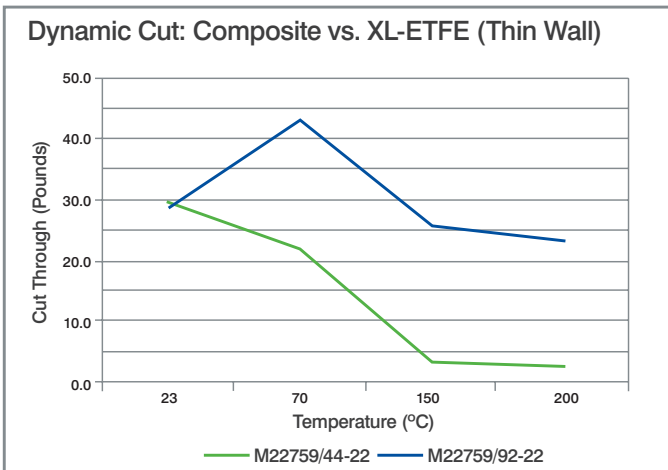
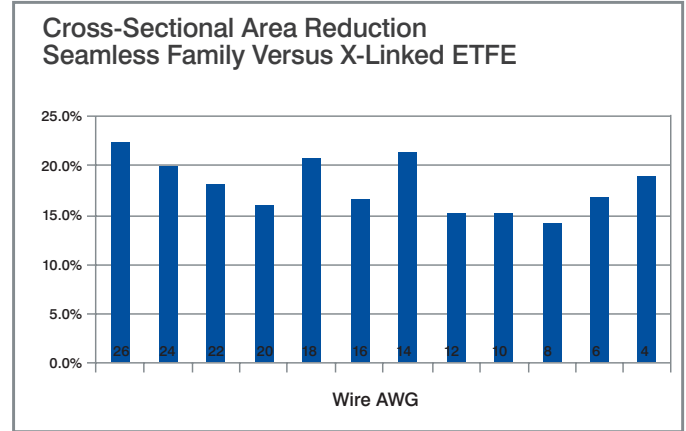
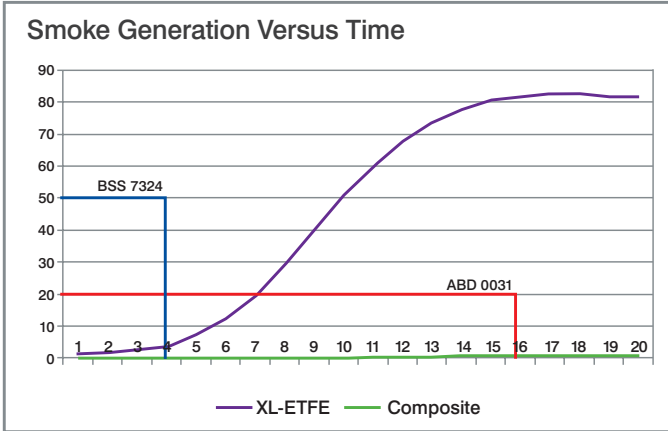
Product Characteristics	Seamless Tape-Wrap /80 - /92	Seamless-T Tape-Wrap /180 - /192
Scrape Abrasion	●●	●●●
Hydrolytic Resistance	●●	●●
Wet Arc Propagation Resistance	●●●	●●●
UV Laser Marking	●●	●●●
Strips Easily and Cleanly	●●	●●

Seamless and Seamless-T Products Exceed AS22759/92 and /192 Requirements

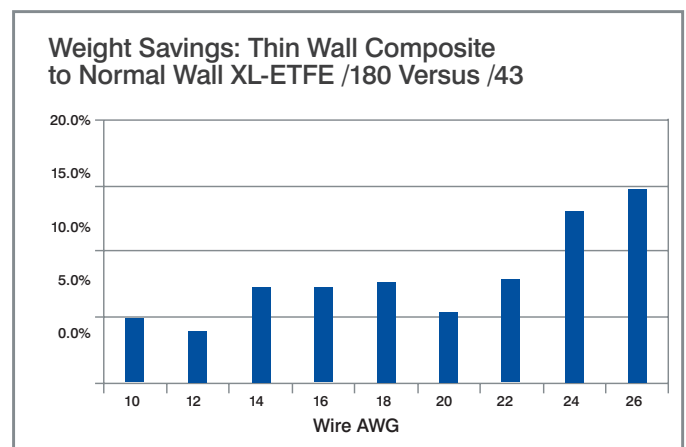
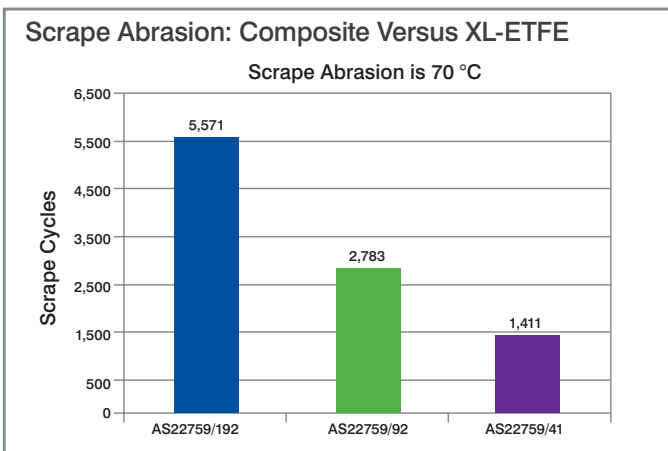


# Composite Wire & Cable Seamless™ Cont'd.

## COMPARISON CHARTS CONT'D.



Example: A wire bundle of ten 20 AWG composite wires can be routed in the area required by eight XL-ETFE wires.



Composite Wire can save between 2% and 15% weight compared to XL-ETFE.



See CarlisleIT's line of Composite Wire & Cable at:  
[CarlisleIT.com/products/wire-cable/composite-aerospace-wire-cable](http://CarlisleIT.com/products/wire-cable/composite-aerospace-wire-cable)

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