PhaseTrack®

Phase Stable Cable Assemblies

- ***Phased Array Systems***
- ***All Phase Sensitive Systems***
- ***All Phase Sensitive Platforms***
- ***All System Platforms***
  (Ground, Sea, Airborne, Space)

TIMES MICROWAVE SYSTEMS
An Amphenol Company

INTRODUCTION

Phase stable interconnects are essential to the performance of many radio frequency and microwave systems. Until now, most solutions utilized PTFE based dielectric medium. The well documented problem with PTFE is a drastic change that occurs at a temperature of approximately 19 degrees C. This change is steep enough to cause significant phase difference between cables that are only fractions of a degree apart in temperature.

Over the last several years Times has developed a product line with a proprietary fluorocarbon material named TF4® that has completely eliminated the knee.

The product was launched in 2004 with the selection of our PT210 and PF402 for a radar mapping satellite requiring over 2000 phase critical assemblies. The success of the technology has led to the expansion of the product to cover a wide range of applications.

The Phasetrack (PT) line of flexible cables now available in sizes ranging from .110" to an 18 GHz .318" optimized design which addresses a wide range of interconnect applications.

Phaseflex (PF) and Phasetrack semi-Rigid (SR) are available in sizes commonly used in most in box applications and are compatible with existing connectors.

Phasetrack LSLT have been developed with a specially blended and processed foam polymer dielectric for longer lower frequency runs that demand a larger cable to minimize loss. Jacketed with our proprietary M17 zero halogen jacket this product is ideal for shipboard and other applications which are required to meet the stringent requirements of MIL-DTL-17.

The phasetrack product line is rounded out with our Si02 dielectric cables that provide the ultimate in performance from cryogenic temperatures to those exceeding 1000 degrees C.

PhaseTrack® Legacy

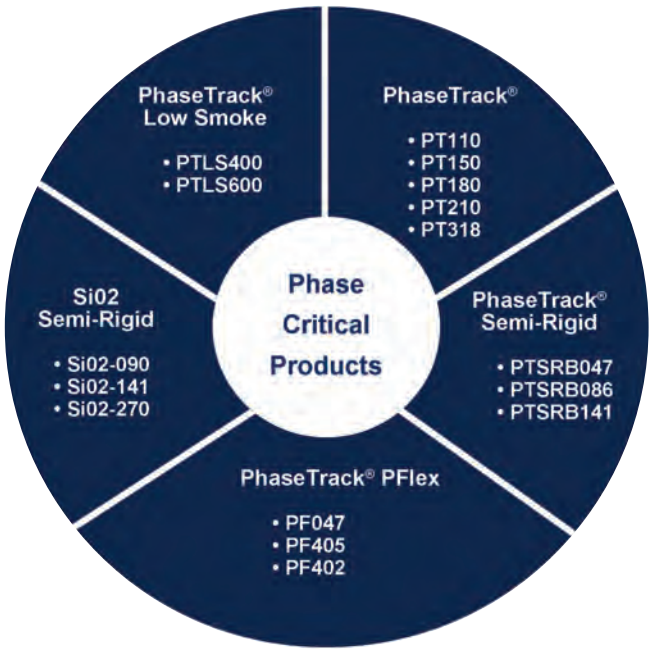
Programs:

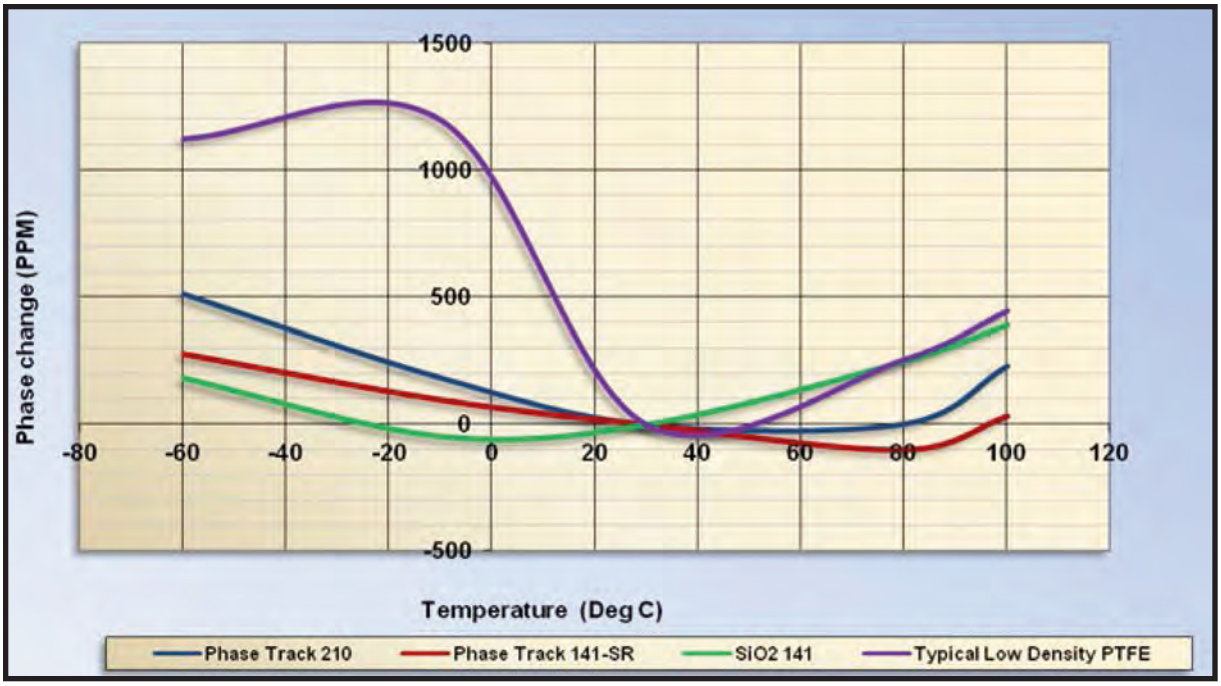
- *Terra SAR-X*
- *Tandem X*
- *EA 18-G*
- *Galactica*
- *F35*
- *TPS-80 G/ATOR*

Applications:

- *Phased Array Antennas*
- *Precision Differential Timing*
- *Synthetic Apertures*
- *Microwave Interferometry*
- *Direction Finding*
- *Test and Measurement*

PhaseTrack® Cable





PhaseTrack®

Phase Stable Cable Assemblies For:

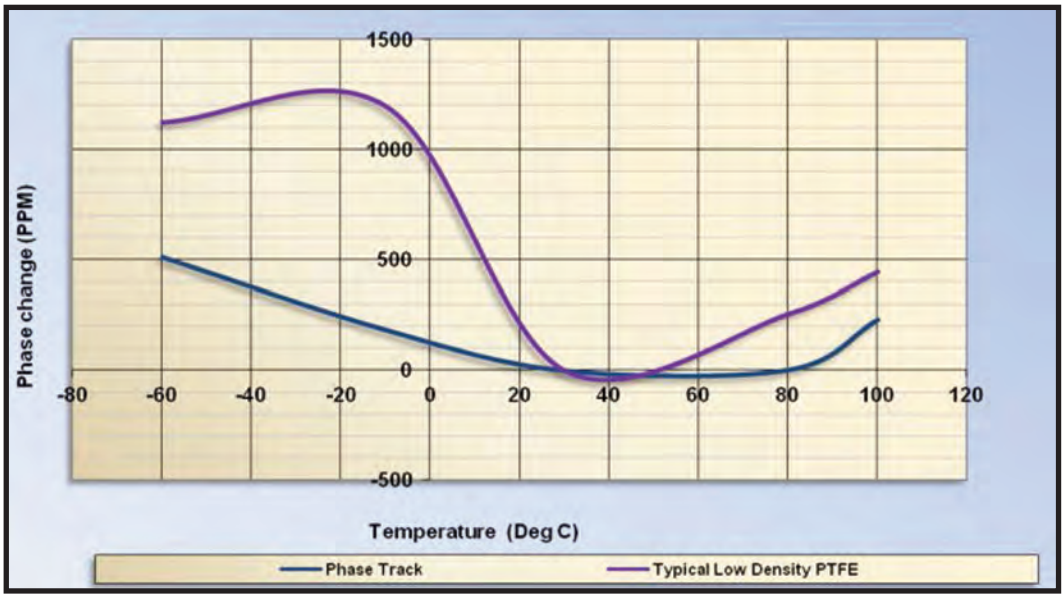
- *Phased Array Systems*
- *System Interconnects*
- *Phase Stable Test Cables*
- *All System Platforms*
  (Ground, Sea, Airborne and Space)

PhaseTrack® cable assemblies are designed for applications demanding minimal phase change over temperature. All PhaseTrack cables use proprietary TF4® dielectric that does not have the abrupt shift in the phase that occurs with solid or tape wrapped PTFE based products under normal room ambient temperature conditions.

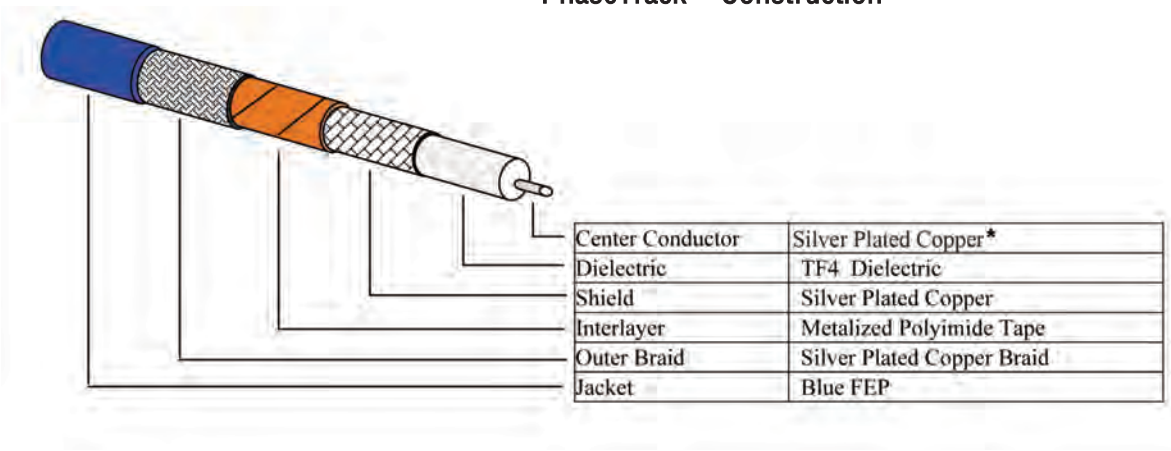
PhaseTrack cable has the same triple shield construction used in Times popular SF®, SFT®, SilverLine® and MT cables.

Features:

- Superior Stability (vs LD PTFE)
- PTFE "Knee" is Nonexistent
- TF4® Dielectric Technology



PhaseTrack® Construction



Part Number	PT110	PT150	PT180	PT210	PT318
Dielectric Technology	TF4®	TF4®	TF4®	TF4®	TF4®
Diameter (in)	0.108	0.145	0.180	0.220	0.315
Minimum Bend Radius	0.550	0.750	1.000	1.125	1.750
Mass (lbs/1000 feet)	14.0	24.0	36.0	46.0	90.0
Temperature Rating	-55C to +150C				
Center Conductor	Silver Plated Copper Clad Steel	Silver Plated Copper			
Outer Conductor	Silver Plated Copper Strip Braid				
Jacket	Blue FEP				
Characteristic Impedance	50 Ohms				
Velocity of Propagation	82.5%	82.5%	83.0%	83.5%	83.5%
Cutoff Frequency (GHz)	80.0	52.4	38.7	29.0	18.9
Delay (nS/foot)	1.23	1.23	1.23	1.23	1.22
Capacitance (pF/foot)	24.7	24.7	24.6	24.4	24.0
Shielding	-90 dB Minimum				
Loss @ 6 GHz (db/100 feet)	64.0	38.4	30.5	24.6	16.7
Loss @ 18 GHz (db/100 feet)	121.0	70.5	58.5	48.4	34.7
K1	0.72391	0.4532	0.33627	0.25971	0.15565
K2	0.0013239	0.00055605	0.00074129	0.00075526	0.00076725

*PT110 uses silver plated, copper clad steel as a center conductor.

PhaseTrack® SR

Phase Stable Cable Assemblies For:

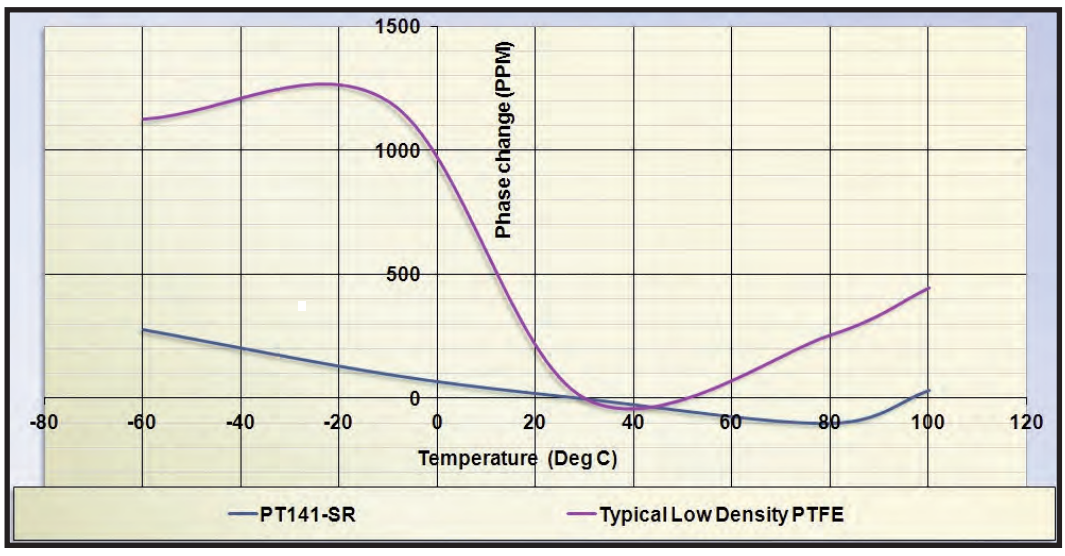
- *Phase-Optimized*
- *Semi-Rigid Cables*
- *All Phase Sensitive Systems*
- *All System Platforms*
  (Ground, Sea, Airborne and Space)

PhaseTrack® SR cable assemblies are designed for applications demanding minimal phase change over temperature.

PhaseTrack® SR cable assemblies are a classic semi-rigid-style cable with optimized phase performance.

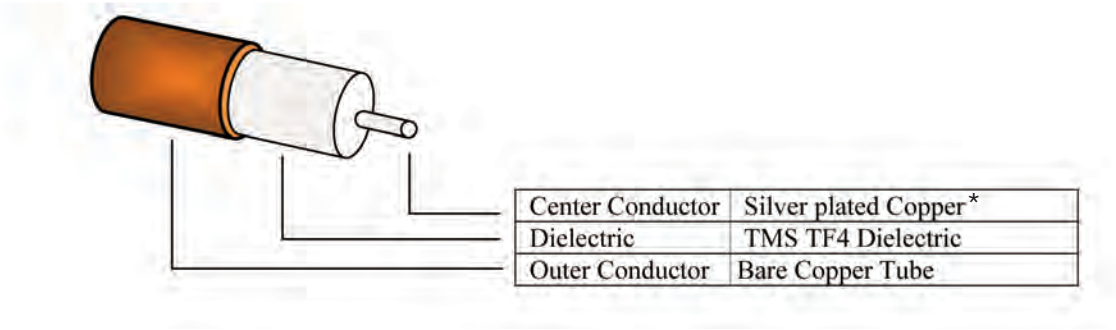
PhaseTrack® SR cables use proprietary TF4™ dielectric that does not have the abrupt shift in phase that occurs with solid or tape wrapped PTFE based products under normal room ambient conditions.

Features:
- Superior Stability (vs LD PTFE)
- PTFE “Knee” is Nonexistent
- TF4® Dielectric Technology



PhaseTrack® SR

PhaseTrack®-SR Construction



Part Number	PTSRB047	PTSRB085	PTSRB141
Dielectric Technology	TF4™	TF4™	TF4™
Diameter (in)	0.047	0.085	0.141
Minimum Bend Radius	0.15	0.25	0.425
Mass (lbs/1000 feet)	4.5	14.2	29.0
Temperature Rating	-55C to + 125C		
Center Conductor	Silver Plated Copper Clad Steel		Silver Plated Copper
Outer Conductor	Bare Copper		
Jacket	NA		
Characteristic Impedance	50 Ohms		
Velocity of Propagation	82.5%	82.5%	82.5%
Cutoff Frequency (GHz)	138.5	80.2	38.4
Delay (nS/foot)	1.23	1.23	1.23
Capacitance (pF/foot)	24.6	24.6	24.6
Shielding	-110 dB Minimum		
Loss @ 6 GHz (db/100 foot)	96.3	55.2	28.2
Loss @ 18 GHz (db/100 foot)	173.8	102.9	54.8
K1	1.17249	0.63712	0.30382
K2	0.00091751	0.0009676	0.00077836

*PTSRB047 and PTSRB085 use silver plated, copper clad steel as a center conductor.

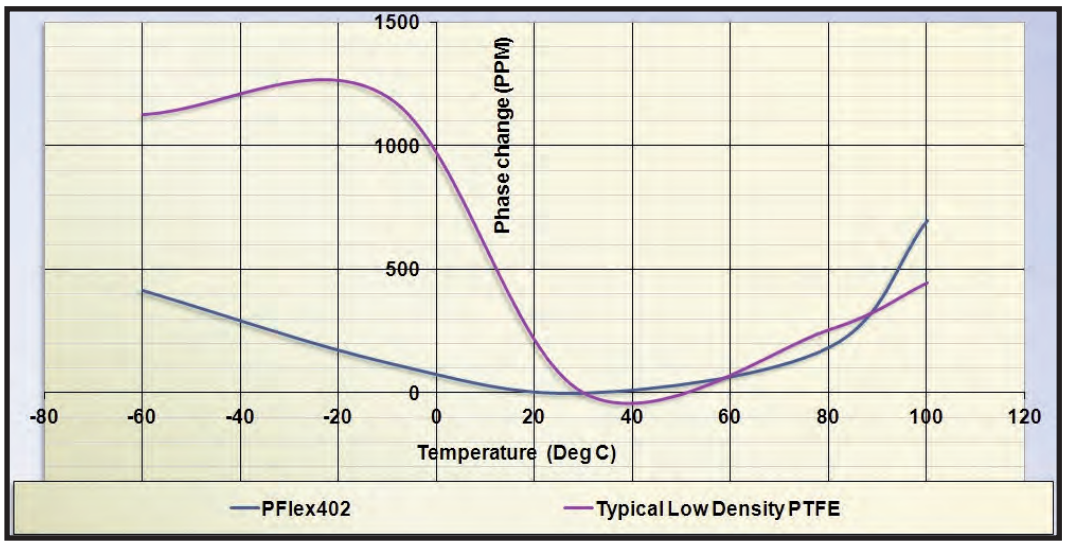
PhaseTrack® PFlex

Phase Stable Cable Assemblies For:

- *All Phase Sensitive Systems*
- *Phase Optimized Flexible Alternative to Semi-Rigid*
- *All System Platforms*
  (Ground, Sea, Airborne, Space)

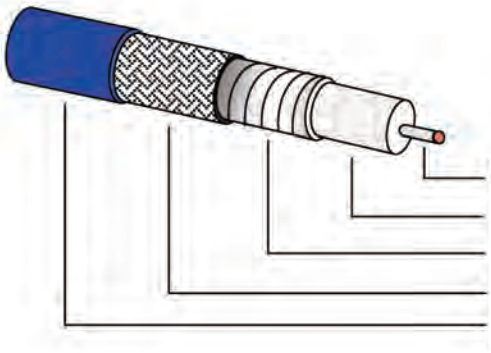
PhaseTrack PFlex cable assemblies are designed for applications demanding minimal phase change over temperature. PFlex cable assemblies are a flexible interconnect-style cable often used as a semi-rigid replacement. PFlex cables use proprietary TF4™ dielectric that does not have the abrupt shift in phase that occurs with solid or tape wrapped PTFE based products under normal room ambient conditions. PFlex cable uses the same shield construction as Times popular TFlex® cables.

Features:
- Superior Stability (vs LD PTFE)
- PTFE "Knee" is Nonexistent
- TF4® Dielectric Technology



PhaseTrack® PFlex

PhaseTrack® PFlex Construction



Center Conductor	Silver Plated Copper*
Dielectric	TMS TF4™ Dielectric
Outer Conductor	Silver Plated Copper
Outer Shield	Silver Plated Copper Braid
Jacket	Blue FEP

Part Number	PF047	PF405	PF130	PF402
Dielectric Technology	TF4™	TF4™	TF4™	TF4™
Diameter (in)	0.064	0.094	0.130	0.160
Minimum Bend Radius	0.250	0.500	0.625	0.750
Mass (lbs/1000 feet)	4.5	11	18	28.0
Temperature Rating	-55C to + 125C			
Center Conductor	Silver Plated Copper Clad Steel		Silver Plated Copper	
Outer Conductor	Silver Plated Copper Strip			
Jacket	Blue FEP			
Characteristic Impedance	50 Ohms			
Velocity of Propagation	82.5%	82.5%	82.5%	82.5%
Cutoff Frequency (GHz)	142.3	79.9	52.3	38.7
Delay (nS/foot)	1.23	1.23	1.23	1.23
Capacitance (pF/foot)	24.4	24.4	24.4	24.4
Shielding	-90 dB Minimum			
Loss @ 6 GHz (db/100 foot)	102.74	59.34	37.96	30.92
Loss @ 18 GHz (db/100 foot)	185.95	110.16	71.61	59.36
K1	1.24487	0.69102	0..43043	0.3399
K2	0.0010516	0.0009697	0.00077	0.0007645

*PF047 and PF405 use silver plated, copper clad steel as a center conductor.

SiO2

SiO2 Phase Stable Cable Assemblies

- *Ultimate in Phase Tracking*
- *All Phase Sensitive Systems*
- *Semi-Rigid Style*
- *Extreme Environments*
- *All System Platforms*

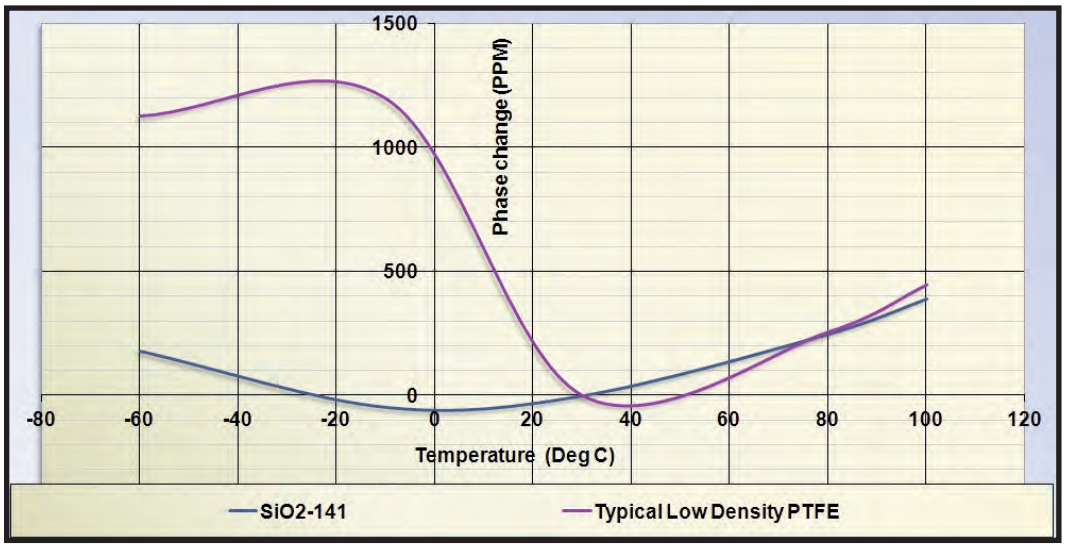
(Ground, Sea, Airborne and Space)

Times SiO2 cable assemblies are used in applications demanding the ultimate in phase tracking performance. SiO2 semi-rigid cable assemblies use a proprietary Silicon Dioxide dielectric material allowing use in extreme environments.

As with other products in the PhaseTrack® product line, the dielectric formulation does not have the abrupt shift in phase that occurs with solid or tape wrapped PTFE based products under normal room ambient conditions.

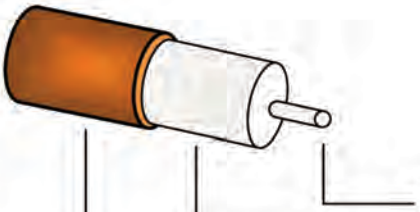
Features:

- Ultimate Phase Tracking Performance
- PTFE "Knee" is Nonexistent
- SiO2 Dielectric Technology
- Semi-Rigid Construction
- Withstands Extreme Environments



SiO2

Si02® Construction



Center Conductor	Oxygen Free Copper
Dielectric	Ultra High Purity Silica
Outer Conductor	Copper Clad Stainless Steel

Part Number	SiO2-090	SiO2-141	SiO2-270
Dielectric Technology	Silica Paste	Silica Paste	Silica Paste
Diameter (in)	0.090	0.141	0.270
Minimum Bend Radius	0.360	0.564	1.080
Mass (lbs/1000 feet)	15.0	24.0	75.0
Temperature Rating	(Available)	-273C to + 1000C	Standard (-80 to +300)
Center Conductor	Oxygen Free Copper		
Outer Conductor	Oxygen Free Copper		
Jacket	304 Stainless Steel		
Characteristic Impedance	50 Ohms		
Velocity of Propagation	80%	80%	80%
Cutoff Frequency (GHz)	60	50	18
Delay (nS/foot)	1.27	1.27	1.27
Capacitance (pF/foot)	25	25	25
Shielding	-120 dB Minimum		
Loss @ 6 GHz (db/100 foot)	41.25	27.3	14.8
Loss @ 18 GHz (db/100 foot)	80.6	56.4	34.8
K1	0.439557	0.259307	0.098031
K2	0.0012	0.0012	0.0012
Product Code	AA9790	AA9789	AA9779
Stock Code	25090	25141	25270

PhaseTrack® LS

Phase Stable Cable Assemblies

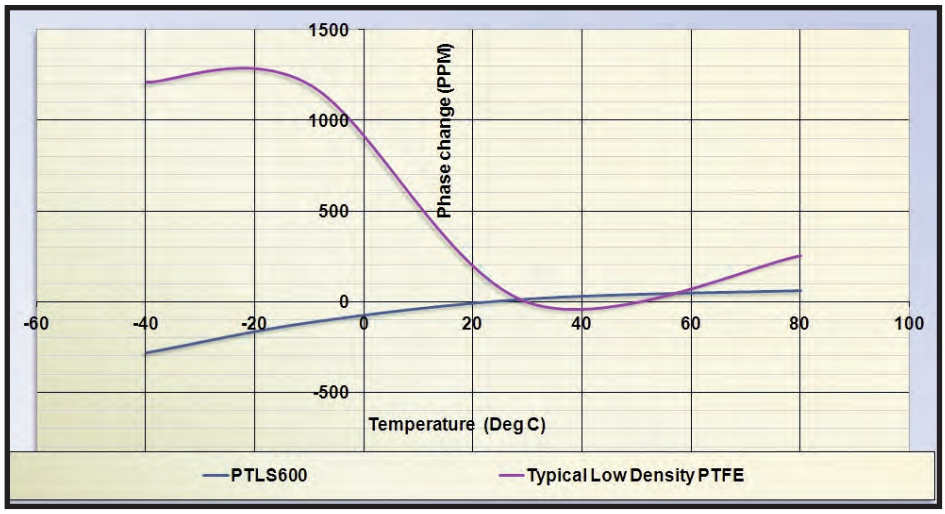
- *Low-Smoke Phase-Optimized Flexible Cable*
- *All Phase Sensitive Systems*
- *Low Smoke Formulation*
- *All System Platforms*
  (Ground, Sea, Airborne and space)

PhaseTrack® LS cable assemblies are designed for applications demanding minimal phase change over temperature.

PhaseTrack® LS cable assemblies are a phase performance optimized version of the Times-exclusive low-loss flexible Low Smoke cables.

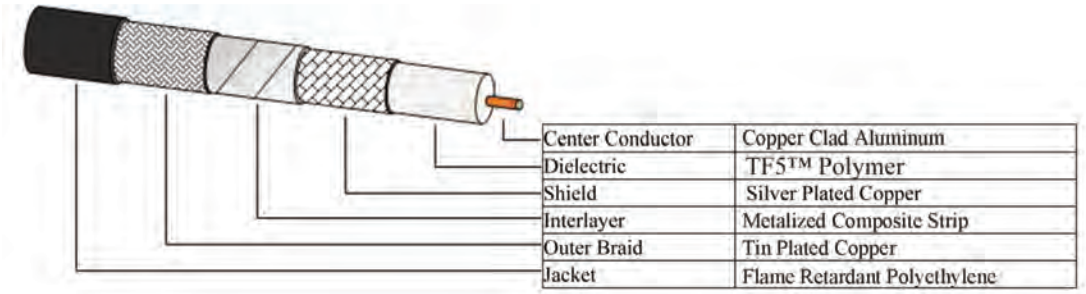
PhaseTrack® LS cables use proprietary TF5™ dielectric that does not have the abrupt shift in phase that occurs with solid or tape wrapped PTFE based products under normal room ambient conditions.

Features:
- Superior Stability (vs LD PTFE)
- PTFE “Knee” is Nonexistent
- TF5 Dielectric Technology



PhaseTrack® LS

PhaseTrack®- LS Construction



Part Number	PTLS400	PTLS600
Dielectric Technology	Polymer Foam	Polymer Foam
Diameter (in)	0.400	0.600
Minimum Bend Radius	4.000	6.000
Mass (lbs/1000 feet)	100.0	160.0
Temperature Rating	-40C to +85C	
Center Conductor	Copper Clad Aluminum	
Outer Conductor	Silver plated Copper Strip Braid	
Jacket	Flame Retardant Polyethylene	
Characteristic Impedance	50 Ohms	
Velocity of Propagation	84.0%	84.0%
Cutoff Frequency (GHz)	16.2	10
Delay (nS/foot)	1.21	1.21
Capacitance (pF/foot)	23.4	23.4
Shielding	-90 dB Minimum	
Loss @ 6 GHz (db/100 feet)	13.2	8.7
Loss @ 10 GHz (db/100 feet)	17.6	11.3
K1	0.150138	0.092086
K2	0.000262	0.000256

Notes:

Notes:

Our Mission

TIMES MICROWAVE SYSTEMS designs and manufactures high performance RF transmission lines. These products consist of flexible coaxial cable, connectors, accessories and cable assemblies.

We are committed to understanding the needs and requirements of our customers and providing highly engineered, cost effective products. TIMES MICROWAVE SYSTEMS is dedicated to total customer satisfaction and superior results for our shareholders in all we do.

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World Headquarters: 358 Hall Avenue Wallingford, CT 06492 • Tel: (203) 949-8400 • (800) 867-2629 • Fax: (203) 949-8423
International Sales: 800.867.2629 - 203.949.8503
www.timesmicrowave.com