ofs

A Furukawa Company

Your Optical Fiber Solutions Partner™

Summary of Test Results

Supplemental Information for Qualified OFS Customer Use

50µm µlinx™ Avionics Cable

p/n C26490

µlinx™ Optical Fiber Cable is a new reduced diameter product with an outer diameter of 0.8mm, smaller than a typical buffered fiber. In the absence of a standard for cables of this size we have used the ARINC 802 test requirements as a framework for the testing defined in this report.

ΔATT = Change in Attenuation

Note: A negative (-) value in Attenuation is a gain (+) in Optical Transmittance

September, 2013

A. OPTICAL CABLE SPECIFICATIONS

Property	Value
Attenuation	≤5.0 dB/km @ 850nm ≤3.0 dB/km @ 1300nm
Max. Installation Load	100N (22.5 lbs.)
Max. Operation Load	38N (8.5 lbs.)
Min. Bend Radius Under Load	12mm (0.47 in.)
Min. Bend Radius Unloaded	8mm (0.31 in.)
Operating Temperature Range	-65°C to +150°C
Storage Temperature Range	-40°C to +80°C
Cable Weight	<0.75 kg/km (< 0.50 lb./kft.)

B. PHYSICAL DIMENSIONS

Property	Value
Fiber Type	Graded Index OM3 High Temperature Coating
Core Diameter	50µm ± 2.5µm
Cladding Diameter	125µm ± 1.0µm
Core/Cladding Concentricity	≤1.0µm
Core Noncircularity	≤5.0%
Cladding Noncircularity	≤2.0%
Numerical Aperture (NA)	0.200 ± 0.015
Bandwidth @ 850nm EMB	≥2000 MHz-km
Bandwidth @ 1300nm EMB	≥500 MHz-km
Bandwidth @ 850nm Overfilled	≥1500 MHz-km
Bandwidth @ 1300nm Overfilled	≥500 MHz-km
Fiber Proof Strength	100 kpsi
Coating Diameter	250µm ± 10µm
Outer Jacket Diameter	800µm ± 50µm
Cable Weight	<0.75 kg/km

C. MECHANICAL PROPERTIES

Test	Measured Value
Flexure Endurance ARINC 802 & TIA/EIA-455-104A 1.45kg load, 6.3mm radius sheaves, +/- 180°, 25°C	After 3,000+ Cycles ΔATT @ 850nm -0.09dB After 3,000+ Cycles ΔATT @ 1300nm -0.18dB After 10,000+ Cycles ΔATT @ 850nm -0.14dB After 10,000+ Cycles ΔATT @ 1300nm -0.46dB Cable jacket did not crack, craze, or split

Test	Measured Value
Knot Test ARINC 802 & TIA/EIA-455-87B 16N force applied to knot tied around 12mm radius mandrel	ΔATT @ 850nm -0.91dB ΔATT @ 1300nm -0.94dB No Broken Fibers During Test
Jacket Shrinkage ARINC 802 3.5m length conditioned -65°C to +150°C, 5 cycles with 1 hour dwell at each temperature extreme	< 0.08% Total Shrinkage, Side A plus Side B
Tensile Loading & Bending TIA/EIA-455-33B 100N force applied over 8mm radius mandrel	100N Force ΔATT @ 850nm 0.71dB ΔATT @ 1300nm 0.74dB Load Removed: ΔATT @ 850nm 0.19dB ΔATT @ 1300nm 0.42dB Elongation at 100N: 0.00%
Cable Scrape Abrasion AIRBUS ABS0963-001 & BS EN3745-503 100N load, 0.25mm radius pin, 100 cycles	ΔATT @ 850nm -0.13dB ΔATT @ 1300nm -0.65dB Cable jacket did not crack, craze, or split

D. ENVIRONMENTAL PROPERTIES

Test	Measured Value
Smoke & Toxicity ARINC 802, Boeing BSS7239/7238 & AIRBUS ABD0031 AITM 2.008A & B	
Boeing 4-Minute Smoke Test, Flaming Mode	Ave. Ds 16.2
Requirement: Maximum smoke density (Ds) 50	Max. Ds 17.7

Toxicity measurements (ppm) during 4-minute Flaming Mode Smoke Test

Requirement		Measured Value
HCN	150 max	< 5
CO	Reference only	57
NOX	100 max	10
SO_2	100 max	< 5
HF	200 max	< 5
HCL	500 max	< 5

Test	Measured Value
Boeing 20-Minute Smoke Test, Flaming Mode	Ave. Ds 33.1
Requirement: Reference only	Max. Ds 44.1

Toxicity measurements (ppm) during 20-minute Flaming Mode Smoke Test

Requirement		Measured Value
HCN	Reference only	< 5
CO	Reference only	153
NOX	Reference only	17
SO_2	Reference only	14
HF	Reference only	< 5
HCL	Reference only	7

Airbus 16-Minute Smoke Test, Non-Flaming Mode	Ave. Ds 1.0
Requirement: Maximum smoke density (Ds) 20	Max. Ds 1.1

Toxicity measurements (ppm) during 16-minute Non-Flaming Mode Smoke Test

Requirement		Measured Value
HCN	150 max	< 5
CO	1000 max	< 5
NOX	100 max	13
SO_2	100 max	< 5
HF	100 max	< 5
HCL	150 max	< 5

ENVIRONMENTAL PROPERTIES (continued)

Test	Measured Value
Airbus 4-Minute Smoke Test, Non-Flaming Mode Requirement: Maximum smoke density (Ds) 200	Ave. Ds 0.3 Max. Ds 0.5

Toxicity measurements (ppm) during 4-minute Non-Flaming Mode Smoke Test

Requirement		Measured Value
HCN	150 max	< 5
CO	1000 max	< 5
NOX	100 max	< 5
SO_2	100 max	< 5
HF	100 max	< 5
HCL	150 max	< 5

Airbus 4-Minute Smoke Test, Flaming Mode Requirement: Maximum smoke density (Ds) 200	Ave. Ds 18.0 Max. Ds 20.8

Toxicity measurements (ppm) during 4-minute Flaming Mode Smoke Test

Requirement		Measured Value
HCN	150 max	< 5
CO	1000 max	78
NOX	100 max	12
SO_2	100 max	< 5
HF	100 max	< 5
HCL	150 max	< 5

E. THERMAL PROPERTIES

Test	Measured Value
Flammability FAR 25.869, 60° Test, 30 second application Requirement: No flaming droplets, self-extinguishing 5 seconds maximum	No dripping, no flaming drips, Self-extinguishing in 0.0 seconds Average burn length: 2.1 inches
Fiber Strength after Thermal Aging TIA/EIA-455-28C	Non-Conditioned: Median 686 kpsi Slope 142 Conditioned 130°C, 168 hours: Median 662 kpsi Slope 97 Conditioned 150°C, 168 hours: Median 663 kpsi Slope 172

THERMAL PROPERTIES (continued)

Accelerated Aging ARINC 802 4 meter cable wrapped around 12mm radius mandrel, 1.0kg load, 150°C, 120 hours	ΔATT @ 850nm 4.34dB ΔATT @ 1300nm 4.44dB
Temperature Cycling ARINC 802, TIA/EIA-455-3A Condition C -65°C to +150°C, 5 cycles, 2 hour dwell at -65°C and +150°C	ΔATT @ 850nm 0.15dB ΔATT @ 1300nm 0.17dB
Flexure Endurance at Low Temperature Boeing .02kg load, 25mm radius sheave, 4 hour soak at -70°C, +/- 360°	After 25 Cycles ΔATT @ 850nm 0.00dB After 25 Cycles ΔATT @ 1300nm 0.00dB After 50 Cycles ΔATT @ 850nm 0.00dB After 50 Cycles ΔATT @ 1300nm 0.00dB Cable jacket did not crack, craze, or split
Low Temperature Bend ARINC 802, TIA/EIA-455-37A -65°C, 6 hours, cable wrapped around 8mm radius mandrel with 2.5kg load	ΔATT @ 850nm 0.65dB ΔATT @ 1300nm 0.59dB Cable jacket did not crack, craze, or split
Temperature Life ARINC 802 & TIA/EIA-455-4C Condition C 150°C, 500 hours	ΔATT @ 850nm 0.10dB ΔATT @ 1300nm 0.09dB