

TECHNICAL SPECIFICATION

1. General

1.1 Scope

Cable type	Application
OPGW 48	High voltage overhead

1.2 Reference

The cables provided by Navigator® need to pass the following international specifications:

IEC 60793-1	Optical fiber Part 1: Generic specifications
IEC 60793-2	Optical fiber Part 2: Product specifications
ITU-T G.652	Characteristics of a single-mode optical fiber cable
ITU-T G.655	Characteristics of a non-zero dispersion-shifted single-mode optical fiber and cable
EIA/TIA 598 B	Color code of fiber optic cables
IEC 60794-4-10	Aerial optical cables along electrical power lines – Family specification for OPGW
IEC 60794-1-2	Optical fiber cables-Part 1-2: Generic specification-Basic optical cable test procedures
IEEE1138-2009	IEEE Standard for testing and performance for optical ground wire (OPGW) for use on electric utility power lines
IEC 61232	Aluminum – clad steel wire for electrical purposes
IEC 60104	Aluminum magnesium-silicon alloy wire for overhead line conductors
IEC 61089	Round wire concentric lay overhead electrical stranded conductors

2. OPTICAL FIBER

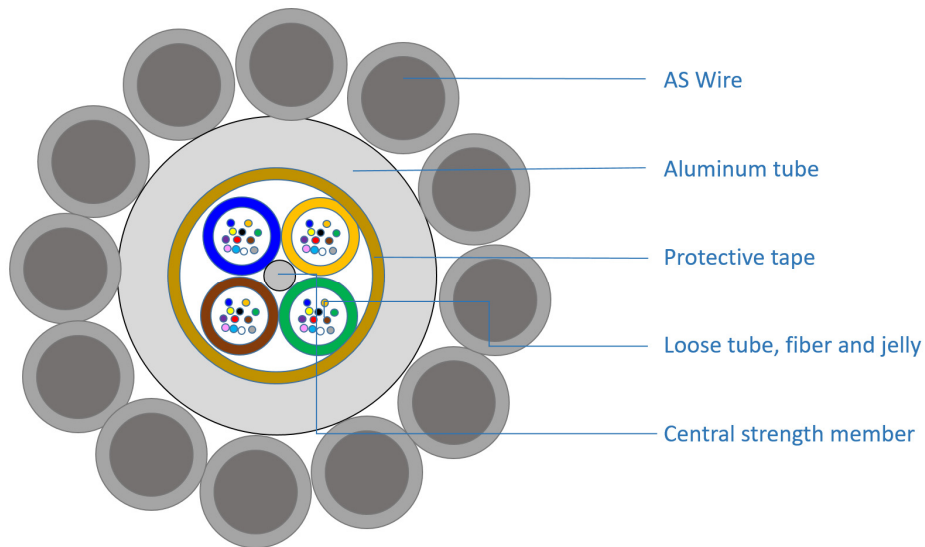
ITU-T G.652.D		
Category	Description	Specifications
Optical Specifications	Attenuation @1310 nm	≤ 0.36 dB/km
	Attenuation @1550 nm	≤ 0.22 dB/km
	Zero Dispersion Wavelength	1300~1324 nm
	Chromatic dispersion @1310nm @1550nm @1625nm	≤ 3.5 ps/(nm·km) ≤ 18 ps/(nm·km) ≤ 22 ps/(nm·km)
	Zero Dispersion Slope	≤ 0.092 ps/nm ² ·km
	PMD _Q	≤ 0.20 ps/√km
	PMD individual value	≤ 0.2 ps/√km
	Cable Cutoff Wavelength (λ_{cc})	≤ 1260 nm
	Macro bending Loss (100 turns; $\Phi 60$ mm) @1625 nm	≤ 0.10 dB
	Mode Field Diameter @1310 nm	$(8.8-9.2) \pm 0.4 \mu\text{m}$
Dimensional Specifications	Cladding Diameter	$125 \pm 0.7 \mu\text{m}$
	Coating diameter	$245 \pm 10 \mu\text{m}$
	Core/clad concentricity error	$\leq 0.6 \mu\text{m}$
	Cladding Non-Circularity	$< 1.0\%$
Mechanical Specifications	Proof stress	≥ 0.69 GPa

ITU-T G.657.A1		
Category	Description	Specifications
Optical Specifications	Attenuation @1310 nm	$\leq 0.36 \text{ dB/km}$
	Attenuation @1550 nm	$\leq 0.22 \text{ dB/km}$
	Dispersion coefficient	@1288~1339nm $\leq 3.5 \text{ ps/nm}\cdot\text{km}$ @1271~1360nm $\leq 5.3 \text{ ps/nm}\cdot\text{km}$ @1550nm $\leq 18 \text{ ps/nm}\cdot\text{km}$ @1625nm $\leq 22 \text{ ps/nm}\cdot\text{km}$
	Zero Dispersion Wavelength	1300~1324 nm
	Zero Dispersion Slope	$\leq 0.092 \text{ ps/nm}^2\cdot\text{km}$
	PMD Link value (M=20cables Q=0.01%) maximum PMDQ	0.20 ps/Vkm
	Cable Cutoff Wavelength (λ_{cc})	$\leq 1260 \text{ nm}$
	Macro bending Loss (10 turns; $\Phi 30 \text{ mm}$) @1550 nm (10 turns; $\Phi 30 \text{ mm}$) @1625 nm (1 turns; $\Phi 20 \text{ mm}$) @1550 nm (1 turns; $\Phi 20 \text{ mm}$) @1625 nm	$\leq 0.25 \text{ dB}$ $\leq 1.0 \text{ dB}$ $\leq 0.75 \text{ dB}$ $\leq 1.5 \text{ dB}$
	Mode Field Diameter @1310 nm	$8.8 \pm 0.4 \mu\text{m}$
Dimensional Specifications	Cladding Diameter	$125 \pm 0.7 \mu\text{m}$
	Cladding non circularity	$\leq 1.0\%$
	Coating diameter	$245 \pm 10 \mu\text{m}$
	Coating non circularity	$\leq 6\%$
	Cladding / coating concentricity error	$\leq 6 \mu\text{m}$
	Core/clad concentricity error	$\leq 0.5 \mu\text{m}$
	Cladding Non-Circularity	$\leq 1.0\%$
Mechanical Specifications	Proof stress	$\geq 0.69 \text{ Gpa}$

3. CABLE STRUCTURE

3.1 Cable type

AlumaCore Optical Ground Wire



Dimensions and Properties

Component Details					
Component	#	OD		Area	
Center					
Aluminum Pipe	1	8.42mm	0.3315in	33.62mm ²	0.0621in ²
Layer 1 – LEFT HAND LAY					
Aluminum Clad Steel (20.3% IACS)	12	2.80mm	0.1102in	73.89mm ²	0.1145in ²
*- Cross Section drawing shown is representative.					

Mechanical/Electrical Details		
Calculated Breaking Load	9,585 kg	21,132 lbs
Maximum Cable Design Tension	5,718 kg	12,606 lbs
Approximate Cable Diameter	14.02 mm	0.552 in
Total Cross-Sectional Area	107.51 mm ²	0.1666 in ²
Approximate Cable Weight	601 kg/km	2,133 lbs/mile
Modulus of Elasticity	12,920 kg/mm ²	18,376 kpsi
Coefficient of Linear Expansion	1.43E-05 1/°C	7.94E-06 1/°F
Sag10™ Chart Number	1-1453	1-1453
Calculated DC Resistance (20°C)	0.5029 Ohms/km	0.8094 Ohms/mile
Short Circuit Rating	81 (kA) ² •sec	81 (kA) ² •sec
Short Circuit Ambient Temperature	40°C	104°F
Short Circuit Duration 1 sec	9.0 kA	9.0 kA

Quick Reference installation Notes		
Approximate Cable Diameter	14.02mm	0.552in
Maximum Stringing Tension (at tensioner) *	1,917kg	4,226lbs
Minimum Bull Wheel Diameter	99cm	39in
Stringing Sheave Diameter**	56cm	22in
Minimum Bending Radius Cable		
Static (No load)	21cm	9in
Dynamic (under tension)	28cm	11in
Fiber		
Static (No load)	3.8cm	1.5in
Buffer Tube		
Static (No load)	8.0cm	3.0in
* - The stringing tension is always measured at the tensioner side. In general, the maximum stringing tension should be approximately half of the maximum sagging tension and should never exceed 20% RBS of the OPT-GW. ** - The value indicated is for the first and last structures of the pull and is based on 40 times the diameter of the OPT-GW. Smaller diameters can be used at tangent structures.		

4. COLOR CODE SCHEME

Fiber color	blue	orange	green	brown	slate	white	red	black	yellow	violet	pink	aqua
Tube color	blue	orange	green	brown	/	/	/	/	/	/	/	/

5. TEST REQUIREMENTS FOR OPGW

Items	Test Procedure
Test on fibers	
Mode field diameter	IEC 60793-1-45
Geometric parameter	IEC 60793-1-20
Attenuation (OTDR)	IEC 60793-1-40
Chromatic dispersion	IEC 60793-1-42
Cut-off wavelength (cable cut off)	IEC 60793-1-44
Test on wires before stranding	
Diameter	IEC61232/ IEC60104
Tensile strength	IEC61232/ IEC60104
Stress at 1% extension (Only ACS wire)	IEC61232
Elongation at break	IEC61232/ IEC60104
Wrapping test (Only AA wire)	IEC60104
Conductivity	IEC61232/ IEC60104
Thickness of Al-cladding (Only ACS wire)	IEC61232
Torsion test (Only ACS wire)	IEC61232
Tests on OPGW	
Quality of surface	IEC 60794-4-10
Direction of lay outer	IEC 60794-4-10
Lay length	IEC 60794-4-10
Diameter of cable	IEC 60794-4-10
Weight of Cable	IEC 60794-4-10
DC-resistance	IEC 60794-4-10
Breaking strength test	IEC 60794-4-10
Stress Strain Test	IEC 60794-4-10
Tensile performance test	IEC 60794-4-10
Sheave test	IEC 60794-4-10
Aeolian vibration simulation	IEC 60794-4-10
Galloping test	IEC 60794-4-10

Creep test	IEC 60794-4-10
Temperature cycle test	IEC 60794-4-10
Water penetration	IEC 60794-4-10
Short circuit current test	IEC 60794-4-10
Lightning test	IEC 60794-4-10

