

TECHNICAL SPECIFICATION

1. General

1.1 Scope

Cable type	Application
OPGW 24	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

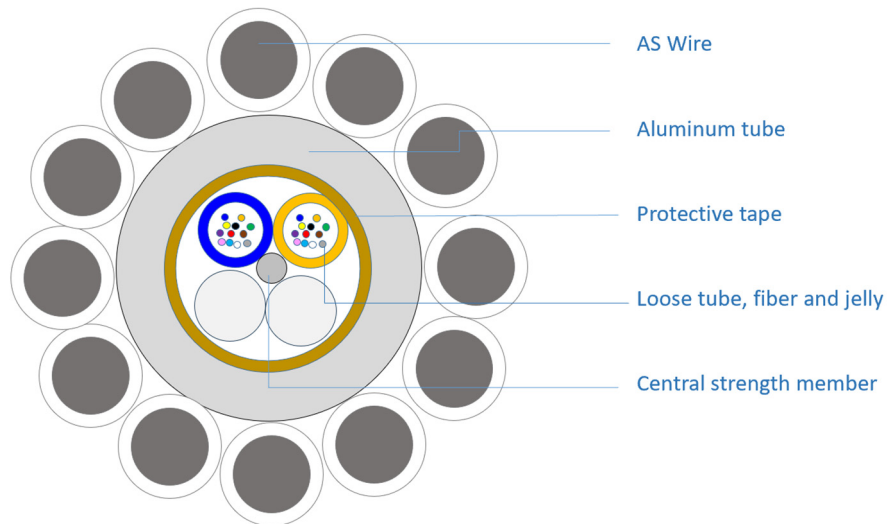
ITU-T G.652.D		
Category	Description	Specifications
Optical Specifications	Attenuation @1310 nm	≤ 0.36 dB/km
	Attenuation @1550 nm	≤ 0.22 dB/km
	Zero Dispersion Wavelength	1300~1324 nm
	Chromatic dispersion @1310nm @1550nm @1625nm	≤ 3.5 ps/(nm·km) ≤ 18 ps/(nm·km) ≤ 22 ps/(nm·km)
	Zero Dispersion Slope	≤ 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	94.1 kN	21,168 lbs
Maximum Cable Design Tension	5,718 kg	12,606 lbs
Approximate Cable Diameter	14.02 mm	0.552 in
Total Cross-Sectional Area	104.9 mm ²	0.1626 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
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	/	/	/	/	/	/	/	/	/	/

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

