Optical Fiber Overhead Ground Wire (OPGW)

OPGW(AL-Tube) - 1S 48 (M100 / R90 - 68)

1. GENERAL

1) SCOPE

This specification covers the general requirements and performance of OPGW offered including optical characteristics, electrical characteristics, mechanical characteristics, geometrical characteristics.

2) REFERENCES

The OPGW offered shall be designed, manufactured and tested according to international standards as follows:

ISO 9001	Quality Management Systems
ISO 14001	Environmental Management Systems
IEEE Std 1138	IEEE Standard construction of composite fiber optic overhead ground wires (OPGW) for use on electric utility power lines
IEC 60793-1	Optical fiber Part 1: Generic specifications
IEC 60793-2	Optical fiber Part 2: Product specifications
IEC 60794-4	Optical fiber cables – Part 4: Sectional specification – Aerial optical cables along electrical power lines
IEC 60104	Aluminum magnesium-silicon alloy wire for over-head line conductors
IEC 61232	Aluminum – clad steel wire for electrical purposes
IEC 60888	Zinc-coated wire for stranded conducts
IEC 60889	Hard-drawn aluminum wire for overhead line conductors
IEC 60114	Recommendation for heat-treated aluminum alloy bus bar material of the aluminum-magnesium-silicon type
IEC 61089	Round wire concentric lay overhead electrical stranded conductors
IEC 61395	Overhead electrical conductors – Creep test procedures for stranded conductors
IEC 61396	Electrical mechanical and physical requirements and test methods of optical ground wire (OPGW)
EIA/TIA 598	Color code of fiber optic cables
ITU-T G.650	Definition and test methods for the relevant parameters of single-mode fibers
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 cable

2. OPTICAL FIBER

G. 652D Type

The optical fiber shall be made of high pure silica and germanium doped silica. UV curable acrylate material is applied over fiber cladding as optical fiber primary protective coating. The detail data of optical fiber performance are shown in the following table:

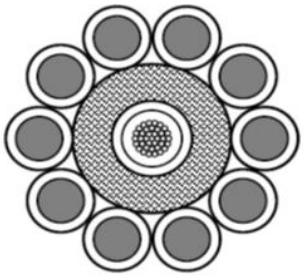
Category	Description	Specifications
Optical Characteristics	Attenuation Coefficient: at 1310 nm at 1550 nm	 ≤ 0.35 dB/km ≤ 0.21 dB/km
	Chromatic Dispersion: at 1310nm at 1550nm	 ≤ 3.5 ps/nm·km ≤ 18 ps/nm·km
	Attenuation Non-uniformity: at 1310nm at 1550 nm	 ≤ 0.03dB ≤ 0.03dB
	Point Discontinuity: at 1310nm at 1550 nm	 ≤ 0.1 dB ≤ 0.1 dB
	Polarization Mode Dispersion (PMD)	≤ 0.2 ps/√km
	Cable Cutoff Wavelength (λ_{cc})	≤ 1260 nm
Geometrical Characteristics	Mode Field Diameter: at 1310nm at 1550 nm	 9.2 ± 0.4μm 10.4 ± 0.5μm
	Cladding Diameter	125 ±1.0μm
	Mode field (Core/clad) concentricity error	≤ 0.6 μm
	Cladding Non-Circularity	≤ 1.0 %
	Coating Diameter	245 ±7μm
	Coating / Cladding Concentricity error	≤ 0.6μm
	Coating-Cladding Concentricity	≤ 12um
	Effective Group Index of Refraction: at 1310nm at 1550 nm	 1.466 1.467
Mechanical Characteristics	Proof Test	≥ 1.0%, 1 sec. ≥ 0.69Gpa (100kpsi)
Environmental Characteristics	Temperature Cycling Induced Attenuation: at 1550nm and 1625 nm (-60°C to +85°C)	0.05dB/km
	Macro bending Loss: at 1550nm and 1625 nm (100 turns; Φ 60 mm)	≤ 0.1dB

3. Drawing and Datasheet of OPGW

AL-Clading Stanless Tube OPGW Cable Specifications

Cable Type: OPGW(AL-Tube) - 1S 48 (M100 / R90 - 68)

Cross Section:



Fiber type: 48xG.652D

	Design :		
	Name	No	Material Dia.
Center	SUS Tube	1 / 48	3.60 mm
	Aluminium Tube	diameter	7.10 mm
Layer1	20.3%ASwire	10	3.00 mm
	AA(LHA2)wire	0	

Stranded:core and layer greased stranding direction of outer layer is "right" hand(Z-stranding)	
Cable Diameter	13.10 mm
Cable Weight	565 kg/km

Technical Data:	according to: IEC、IEEE 1138 - 2009 standards		
	Supporting Cross Section		100.10 mm²
	Section of AS Wire	70.69 mm²	
	Section of AA Wire / AL-tube	0.00 / 29.41 mm²	
	Rate Tensile Strength (RTS)		90.2 kN
	Modulus of Elasticity (E-Modulus)		130.9 kN/mm²
	Thermal Elongation Coefficient		14.3 10^{-6}/℃
	Permissible Maximum Working Stress(MAT) (40%RTS)		360.6 N/mm²
	Everyday Stress (EDS)(16%~25%RTS)	144.3 ~	225.4 N/mm²
	Strain Margin Stress (60%RTS)		540.9 N/mm²
	DC Resistance (at 20 ℃)		0.538 Ω/km
	Short Circuit Current (1.00s, 20℃~200℃)		8.25 kA
	Short Circuit Current Capacity (20℃~200℃)	(I^2t)	68.08 kA²s
	Minimum Bending Radius (installation)		393 mm
	Installation Tensile Strength (≤20%RTS)		≤18.0 kN
Temperature Range:	Installation		-10℃ ~ +50 ℃
	Transportation and Operation		-40℃ ~ +80 ℃

Remarks: All Sizes and Values are Nominal Values

1 / 48 - Tubes / Fibers of Tube

M100 - Supporting Cross Section

R90 - Rate Tensile Strength (RTS)

68 - Short Circuit Current Capacity (20℃~200℃)

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4. COLOR IDENTIFICATION OF FIBER IN OPGW

OPGW 光缆-光纤色谱表
OPGW Cable – Fiber Color Coding

一、光纤的色谱排列顺序：fiber color coding permutation

色环 ring maker / 色谱 color	无色环 No ring mark	单色环 One ring mark	双色环 Two ring mark	三色环 Three ring mark
兰 blue	1	13	25	37
桔 orange	2	14	26	38
绿 green	3	15	27	39
棕 brown	4	16	28	40
灰 grey	5	17	29	41
白 white	6	18	30	42
红 red	7	19	31	43
黑 black	8			
自然色 nature		20	32	44
黄 yellow	9	21	33	45
紫 violet	10	22	34	46
粉红 pink	11	23	35	47
青绿 dark green	12	24	36	48

5. TEST REQUIREMENTS FOR OPGW

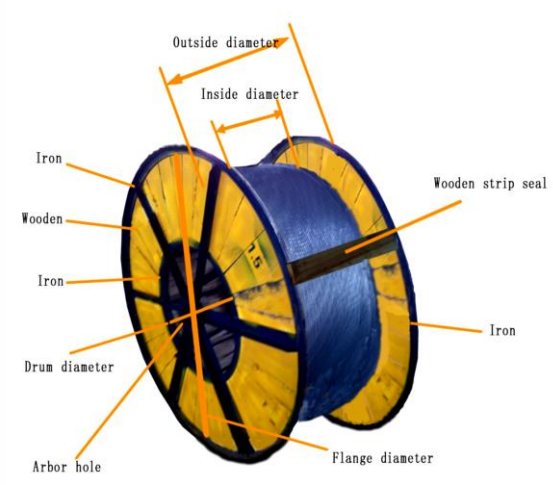
OPGW shall be accordance with applicable standard of OPGW and requirement of customer. The following test items shall be carried out according to corresponding reference.

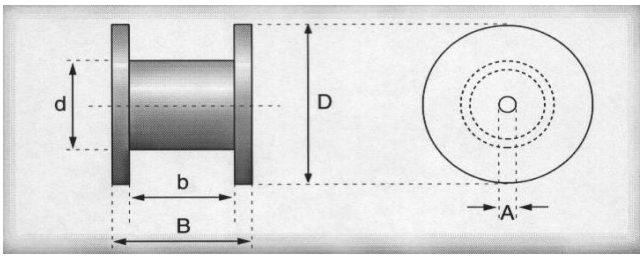
No	Item	Standard Reference
Tests of Optical Fiber		
1	Attenuation coefficient	IEEE Std 1138
2	Chromatic dispersion	IEEE Std 1138
3	Mode field diameter	IEEE Std 1138
4	Cladding diameter	IEEE Std 1138
5	Cladding non-circularity	IEEE Std 1138
6	Core/clad concentricity error	IEEE Std 1138
7	Coating diameter	IEEE Std 1138
8	Coating non-circularity	IEEE Std 1138
9	Cable cutoff wavelength	IEEE Std 1138
Tests of Wire Before Stranding		
1	Diameter	IEEE Std 1138
2	Tensile strength	
3	Elongation at breaking	
4	Resistance	
Tests of Completed OPGW		
1	**TENSILE TEST**	IEEE Std 1138
2	**STRESS-STRAIN TEST**	
3	**WATER INGRESS TEST**	
4	**CRUSH TEST**	
5	**IMPACT TEST**	
6	**TEMPERATURECYCLING TEST**	
7	**SEEPAGE OF FLOODING TEST**	
8	**SHEAVE TEST**	IEEE Std 1138
9	**SHORT CIRCUIT TEST**	IEEE Std 1138
10	**AEOLIAN VIBRATION TEST**	IEEE Std 1138
11	**GALLOPING TEST**	IEEE Std 1138
12	**CREEP TEST**	IEEE Std 1138
13	**LIGHTNING TEST**	IEC Std.
14	**SALT SPARY CSRROSION TEST**	IEEE Std 1138

Note: the above-mentioned items 2-14 (bold font and color marked) which are conducted in independent Lab., that should be paid by the Buyer.

6. PACKING AND DRUM FOR OPGW

OPGW shall be wound on a non-returnable wooden drum or metal drum. Both ends of OPGW shall be securely fastened to drum and sealed with a shrinkable cap. The required marking shall be printed with a weather-proof material on the outsides of drum according to customer's requirement.





Cable Diameter (mm)	Drum Length (m)	Drum Dimensions & Weights					
		D	b	B	d	A	weight
		cm	cm	cm	cm	cm	kg
13.10	3804	130	85	110	70	10	166
	4293	135	85	110	70	10	177
	4802	140	85	110	70	10	189
	5330	145	85	110	70	10	201
	5879	150	85	110	70	10	214