TECHNICAL SPECIFICATION

Optical Ground Wire (OPGW)

ÉRIU Sourcing

OPGW-24G652-2S-111

[71.0 kN ; 92.5 kA²S]

Cable Type	Fiber Count	Fiber Type	Cable Diameter	RTS
OPGW-24G652 -2S-111	**24**	**G.652 (ULL)**	**14.00 mm**	**71.0 kN**

1. SCOPE

This specification covers Optical Ground Wire Cables (OPGW) for installation on high voltage overhead power lines. The cable contains optical fibers for data transmission and telecom purposes and is installed instead of a conventional ground wire. This specification describes the basic design of an OPGW cable with its main components: the fibers, the optical fiber unit, and the cable armoring. It also covers quality assurance during manufacturing, final acceptance tests, type tests, and packaging.

Quality Assurance	ISO 9001 certified manufacturing with multi-level quality control programs ensuring consistent cable performance.
Reliability	Rigorous initial and periodic qualification testing of each product family to assure field performance and durability.

1.5 Reference Standards

Standard	Description
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
IEEE 1138-2009	Standard for testing and performance for 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 SPECIFICATIONS

The optical fiber is made of high-purity silica and germanium-doped silica. UV curable acrylate material is applied over the fiber cladding as primary protective coating. Special spun device successfully controls PMD values, ensuring stability during cabling.

G.652 (ULL) Fiber — In-Cable Performance

Category	Parameter	Specification
	Attenuation @ 1310 nm	≤ **0.31 dB/km**
	Attenuation @ 1550 nm	≤ **0.18 dB/km**
	Zero Dispersion Wavelength	1300 ~ 1324 nm
	Zero Dispersion Slope	≤ 0.092 ps/nm^2·km
Optical	PMD Link Value	≤ 0.2 ps/√km
	Cable Cutoff Wavelength (λcc)	≤ 1260 nm
	Macro Bending Loss (100 turns, Ø50 mm) @ 1550 nm	≤ 0.05 dB
	Macro Bending Loss (100 turns, Ø50 mm) @ 1625 nm	≤ 0.10 dB
	Mode Field Diameter @ 1310 nm	9.2 ± 0.4 µm
	Cladding Diameter	125 ± 1.0 µm
Dimensional	Core/Clad Concentricity Error	≤ 0.6 µm
	Cladding Non-Circularity	≤ 1%
Mechanical	Proof Stress	≥ 0.69 GPa

3. CABLE STRUCTURE & TECHNICAL DATA

Cable Type: OPGW-24G652-2S-111 [71.0; 92.5]

3.1 Cable Structure

Layer	Material	Qty	Contents	Qty	Diameter
Center	20.3% AS wire	1	—	—	2.80 mm
Layer 1	20.3% AS wire	5	—	—	2.80 mm
	SUS Tube	1	Fibers (all tube)	24	2.80 mm
Layer 2	AA wire	12	—	—	2.80 mm
Fiber	G.652	24	—	—	—

Stranded: core and Layer 1 greased. Stranding direction of outer layer is right hand (Z-stranding). Designed and manufactured according to IEC and IEEE standards.

3.2 Technical Data

Parameter	Value
Cable Diameter	14.00 mm
Cable Weight	465 kg/km
Supporting Cross Section	110.8 mm^2
Section of AS Wire	36.95 mm^2
Section of AA Wire	73.89 mm^2
Rated Tensile Strength (RTS)	**71.0 kN**
Modulus of Elasticity (E-Modulus)	97.3 kN/mm^2
Thermal Elongation Coefficient	17.5×10^{-6} /°C
Permissible Maximum Working Stress (40% RTS)	256.4 N/mm^2
Everyday Stress (EDS) (16%~25% RTS)	102.6 ~ 160.3 N/mm^2
DC Resistance	0.379 Ω/km
Short Time Current (1s, 20°C ~ 160°C)	9.6 kA
Short Time Current Capacity I^2t	**92.52 kA^2S**

3.3 Bending Radius & Temperature Range

Parameter	Condition	Value
Minimum Bending Radius	Installation	280 mm
	Operating	210 mm
Temperature Range	Installation	-10°C ~ +50°C
	Transport & Operation	-40°C ~ +85°C

4. FIBER COLOR IDENTIFICATION

Typical number of fibers: 24

Group	1	2	3	4	5	6
Without Color Ring	1 Blue	2 Orange	3 Green	4 Brown	5 Gray	6 White
	7 Red	8 Nature	9 Yellow	10 Violet	11 Pink	12 Aqua
With S150 Color Ring	13 Blue	14 Orange	15 Green	16 Brown	17 Gray	18 White
	19 Red	20 Nature	21 Yellow	22 Violet	23 Pink	24 Aqua

Color Ring Method (S150): Single black color ring on the fiber surface with 150 mm alternation (ring width: 2.0 mm). Fibers 13–24 are distinguished from fibers 1–12 by the presence of this periodic black ring marking.

5. TEST REQUIREMENTS

Three test series assure the quality of OPGW: Routine tests (in-process per internal quality plan), Factory Acceptance Tests (FAT, witnessed by customer), and Type Tests (for new designs, per IEC 60794-4-10 or IEEE Std 1138). Type tests may be waived by submitting a maker's certificate from an internationally acknowledged independent test laboratory.

5.1 Fiber Tests

Test Item	Routine	FAT	Type	Procedure
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			●	IEC 60793-1-44

5.2 Wire Tests (Before Stranding)

Test Item	Routine	FAT	Type	Procedure
Diameter	●	●		IEC 61232 / IEC 60104
Tensile Strength	●	●		IEC 61232 / IEC 60104
Stress at 1% Extension (ACS only)	●	●		IEC 61232
Elongation at Break	●	●		IEC 61232 / IEC 60104
Wrapping Test (AA only)	●	●		IEC 60104
Conductivity	●	●		IEC 61232 / IEC 60104
Al-Cladding Thickness (ACS only)	●	●		IEC 61232
Torsion Test (ACS only)	●	●		IEC 61232

5.3 OPGW Cable Tests

Test Item	Routine	FAT	Type	Procedure
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

6. PACKING & DRUM SPECIFICATIONS

OPGW shall be wound onto a non-returnable wooden drum or iron-wooden drum. Both ends of the OPGW shall be securely fastened to the drum and sealed with a shrinkable cap. Required marking shall be printed with weatherproof material on the outer surfaces of the drum per customer requirements.

Drum Dimensions (Cable Diameter: 13.0–14.5 mm)

Drum Length (m)	D (cm)	b (cm)	B (cm)	d (cm)	A (cm)	Weight (kg)
2,000	130	90	110	80	10.5 ± 0.5	190
3,000	140	90	110	80	10.5 ± 0.5	200
4,000	150	90	110	80	10.5 ± 0.5	230
5,000	160	90	110	80	10.5 ± 0.5	260