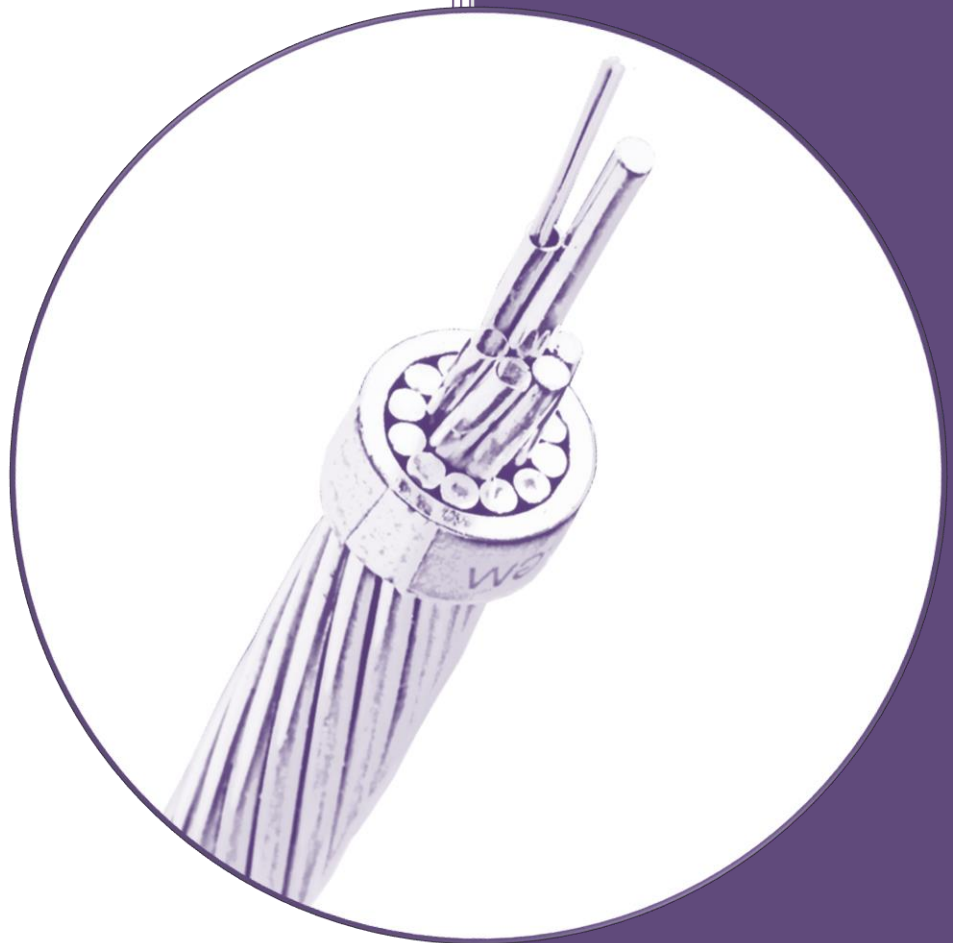




**METRIC**  
INDUSTRIAL

# FibreCore OPGW Optisk jordline



**FibreCore OPGW** benyttes til erstatning av eksisterende jord line, eller ved etablering av ny jord line. Fibrene ligger i et fettfylt aluminiums belagt rustfritt stålrør. Røret tillater god overlengde av fiber samt oppdeling av fibre i grupper av 12 fibre med hjelp av binder garn. Oppdeling med binder garn gjør utgreing, bearbeiding og skjøting enkelt og effektivt.

## 1. General

### 1.1 Scope

This specification covers Optical Ground Wire Cables (OPGW) for the installation on high voltage overhead power lines. The cable contains optical fibers for data transmission and telecom purposes and is installed instead of a ground wire. The specification describes the basic design of an OPGW-cable with its main components: The fibers, the optical fiber unit and the cable armoring. Furthermore, this specification contains information concerning the quality assurance during manufacturing, the final acceptance tests, the type tests and the packaging. Any technical data mentioned in this product specification serve for describing the product only and should not be understood as an assurance of properties.

### 1.2 Cable Description

Cable, which has the dual performance, functions of a conventional ground wire with telecommunication capabilities.

### 1.3 Quality

Quality is ensured by a continuing level of quality in our cable products through several quality control programs including ISO 9001.

### 1.4 Reliability

Product reliability is ensured through rigorous qualification testing of each product family. Both initial and periodic qualification testing are performed to assure the cable's performance and durability in the field environments.

### 1.5 Reference

The cable, which are designed, manufactured and tested according to international standards as follows:

|                |  |
|----------------|--|
| IEC 60793-1    | Optical fiber Part 1: Generic specifications   |
| IEC 60793-2    | Optical fiber part2: Product specifications  |
| ITU-T G.652    | Characteristics of a single-mode optical fiber and cable   |
| ITU-T G.655    | Characteristics of a non-zero dispersion-shifted single-mode optical fiber and cable                             |
| IEC 60741-1-2  | Generic specification. Basic optical cable test procedures   |
| IEC 60794-4-10 | Aerial optical cables along 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 |
| ITU-T G.650    | Definition and test methods for the relevant parameters of single-mode fibers                                    |
| 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

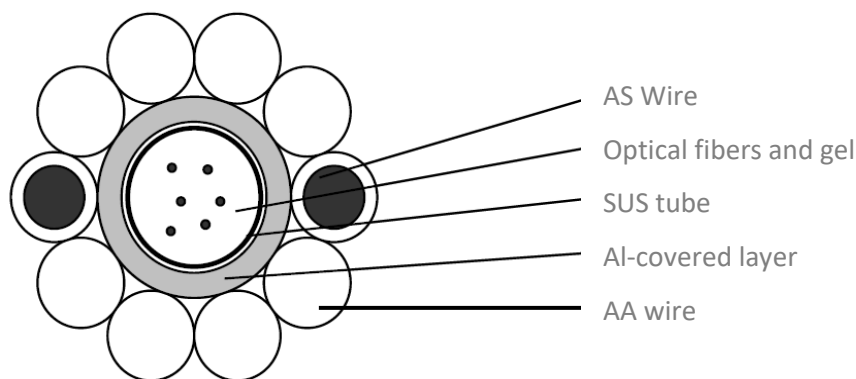
The optical fiber is made of high pure silica and germanium doped silica. UV curable acrylate material is applied over fiber cladding as optical fiber primary protective coating. The detail data of optical fiber performance are shown in the following table. ITU-T G652 fiber uses special spun device to successfully control the value of PMD to ensure stability during cabling.

### G.652D Fiber

| Category                   | Description                                   | Specifications                      |               |
|----------------------------|---|-------------------------------------|---------------|
|                            |   | Before cabling                      | After cabling |
| Optical Specifications     | Attenuation @ 1310 nm                         | ≤0,34 dB/km                         | ≤0,36 dB/km   |
|                            | Attenuation @ 1550 nm                         | ≤0,20 dB/km                         | ≤0,22 dB/km   |
|                            | Zero Dispersion Wavelength                    | 1300~1324 nm                        |               |
|                            | Zero Dispersion Slope                         | 0,073 ~ 0,092ps/nm <sup>2</sup> -km |               |
|                            | Chromatic dispersion @1288~1339 nm            | ≤3,5ps/nm-km                        |               |
|                            | @1271~1360 nm                                 | ≤5,3ps/nm-km                        |               |
|                            | @ 1550 nm                                     | ≤18ps/nm-km                         |               |
|                            | Polarization Mode Dispersion (PMD) Max. Value | ≤0,2 ps/vkm                         |               |
|                            | Cable Cutoff Wavelength (λ)                   | ≤1260 nm                            |               |
|                            | Macro bending loss. 100 turns ø50mm @ 1550 nm | ≤0,05 dB                            |               |
|                            | Macro bending loss. 100 turns ø50mm @ 1625 nm | ≤0,10 dB                            |               |
|                            | MDF (Mode Field Diameter) @1310 nm            | 9,2±0,4 μm                          |               |
| Dimensional Specifications | Fiber Curl Radius                             | ≥4,0 m                              |               |
|                            | Cladding Diameter                             | 125 ± 0,7 μm                        |               |
|                            | Core/clad concentricity error                 | ≤0,6 μm                             |               |
|                            | Cladding non-circularity                      | ≤1,0 %                              |               |
|                            | Coating Diameter                              | 245 ± 10 μm                         |               |
|                            | Coating/Cladding Concentricity                | ≤12 μm                              |               |
| Mechanical Specifications  | Proof stress                                  | ≥0,69Gpa                            |               |

### 3. Cable

3.1 G48-9/125 OPGW-AST-65 / Elnr. 1000991

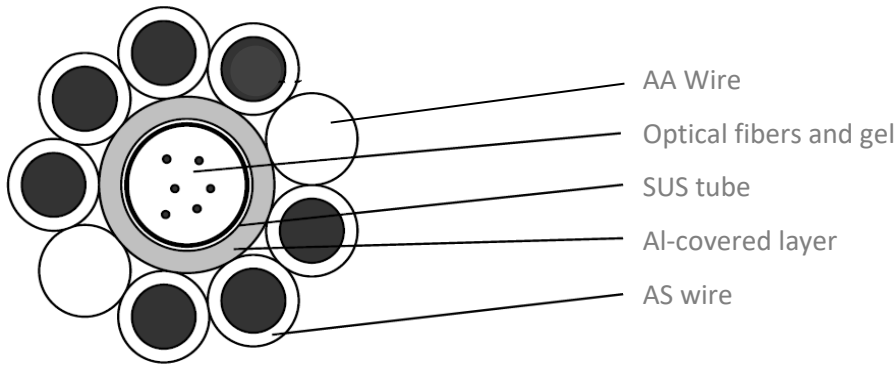


| OPGW Structure |         | Material      | No | Material   | No.     | Material Dia.  |         |
|----------------|---------|---------------|----|------------|---------|----------------|---------|
|                | Fiber   | G.652D        | 48 |            |         |                |         |
|                | US tube | SUS           | 1  |            |         | SUS outer dia. | 3,50 mm |
|                | Al-Tube |               | 1  | Inner dia. | 3,70 mm | Outer dia.     | 5,60 mm |
|                | Layer 1 | 20,3% AS wire | 5  | AA wire    | 5       | Diameter       | 2,50 mm |

### 5. Outer sheath

|                        |  |                             |
|------------------------|--|-----------------------------|
| Technical Data         | Acc. to IEC 60794-4-1, IEEE-1138 standards. Stranding direction of outer layer is right hand (Z-stranding) |                             |
|                        | Cable Diameter   | 10,80 mm                    |
|                        | Cable Weight   | 299 kg/km                   |
|                        | Supporting Cross Section   | 64,8 mm <sup>2</sup>        |
|                        | Section of AS Wire   | 24,54 mm <sup>2</sup>       |
|                        | Section of AA Wire   | 24,54 mm <sup>2</sup>       |
|                        | Section of AL Tube   | 15,67 mm <sup>2</sup>       |
|                        | Rated Tensile Strength (RTS)   | 36,8 kN                     |
|                        | Modulus of Elasticity (E-Modulus)  | 99,6 kN/mm <sup>2</sup>     |
|                        | Thermal Elongation Coefficient   | 16,8 x 10 <sup>-6</sup> /°C |
|                        | Permissible Maximum Working Stress (60% RTS)   | 340,7 N/mm <sup>2</sup>     |
|                        | Everyday Stress (EDS) (16%~25% RTS)  | 91,0~142.2 N/mm             |
|                        | DC Resistance  | 0,631 Ω/km                  |
|                        | Short Time Current (1s)  | 6,3 kA                      |
|                        | Short Time Current Capacity (20°C~200°C)   | 40,1 kA <sup>2</sup> s      |
| Minimum Bending Radius | Installation   | 216 mm                      |
|                        | Operating  | 162 mm                      |
| Temperature Range      | Installation   | -15°C ~ +50°C               |
|                        | Transportation and Operation   | -40°C ~ +80°C               |
| Span length            | Typical span length  | 200 mtr.                    |

Remarks: All Sizes and Values are Nominal values. Diameter Tolerance: ±1%, Weight Tolerance: ±2%

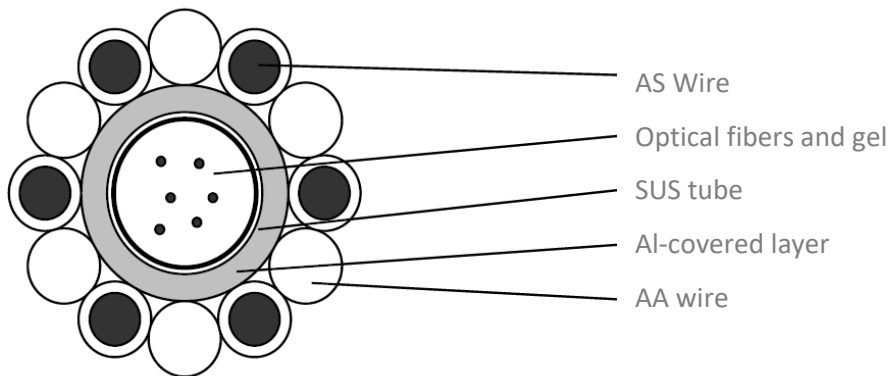


| OPGW Structure |         | Material      | No | Material   | No.     | Material Dia.  |         |
|----------------|---------|---------------|----|------------|---------|----------------|---------|
|                | Fiber   | G.652D        | 48 |            |         |                |         |
|                | US tube | SUS           | 1  |            |         | SUS outer dia. | 3,50 mm |
|                | Al-Tube |               | 1  | Inner dia. | 3,70 mm | Outer dia.     | 6,00 mm |
|                | Layer 1 | 20,3% AS wire | 7  | AA wire    | 2       | Diameter       | 3,00 mm |

5. Outer sheath

|                   |  |                             |
|-------------------|--|-----------------------------|
| Technical Data    | Acc. to IEC 60794-4-1, IEEE-1138 standards. Stranding direction of outer layer is right hand (Z-stranding) |                             |
|                   | Cable Diameter   | 13,00 mm                    |
|                   | Cable Weight   | 435 kg/km                   |
|                   | Supporting Cross Section   | 81,1 mm <sup>2</sup>        |
|                   | Section of AS Wire   | 49,48 mm <sup>2</sup>       |
|                   | Section of AA Wire   | 14,14 mm <sup>2</sup>       |
|                   | Section of AL Tube   | 17,52 mm <sup>2</sup>       |
|                   | Rated Tensile Strength (RTS)   | 67,2 kN                     |
|                   | Modulus of Elasticity (E-Modulus)  | 122,2 kN/mm <sup>2</sup>    |
|                   | Thermal Elongation Coefficient   | 14,9 x 10 <sup>-6</sup> /°C |
|                   | Permissible Maximum Working Stress (70% RTS)   | 580,0 N/mm <sup>2</sup>     |
|                   | Everyday Stress (EDS) (16%~25% RTS)  | 132,4~206,9 N/mm            |
|                   | DC Resistance  | 0,515 Ω/km                  |
|                   | Short Time Current (1s)  | 7,4 kA                      |
|                   | Short Time Current Capacity (20°C~200°C)   | 55,2 kA <sup>2</sup> s      |
|                   | Minimum Bending Radius   | Installation                |
| Operating         |  | 180 mm                      |
| Temperature Range | Installation   | -15°C ~ +50°C               |
|                   | Transportation and Operation   | -40°C ~ +80°C               |
| Span length       | Typical span length  | 600 mtr.                    |

Remarks: All Sizes and Values are Nominal values. Diameter Tolerance: ±1%, Weight Tolerance: ±2%

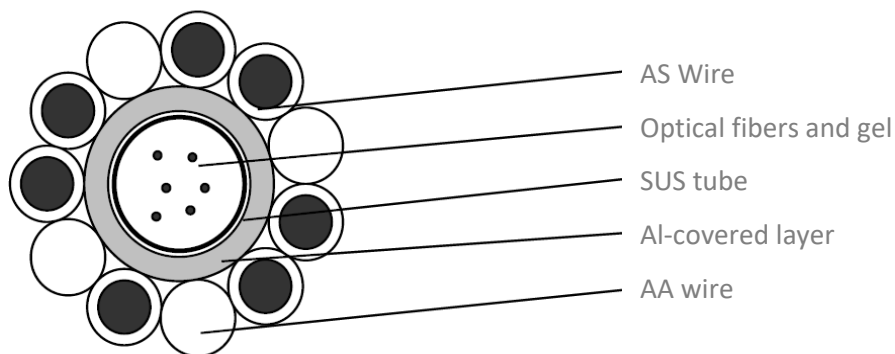


| OPGW Structure |         | Material      | No | Material   | No.     | Material Dia.  |         |
|----------------|---------|---------------|----|------------|---------|----------------|---------|
|                | Fiber   | G.652D        | 96 |            |         |                |         |
|                | US tube | SUS           | 1  |            |         | SUS outer dia. | 4,50 mm |
|                | Al-Tube |               | 1  | Inner dia. | 4,70 mm | Outer dia.     | 7,40 mm |
|                | Layer 1 | 20,3% AS wire | 6  | AA wire    | 6       | Diameter       | 2,50 mm |

5. Outer sheath

|                   |  |                             |
|-------------------|--|-----------------------------|
| Technical Data    | Acc. to IEC 60794-4-1, IEEE-1138 standards. Stranding direction of outer layer is right hand (Z-stranding) |                             |
|                   | Cable Diameter   | 12,40 mm                    |
|                   | Cable Weight   | 382 kg/km                   |
|                   | Supporting Cross Section   | 84,6 mm <sup>2</sup>        |
|                   | Section of AS Wire   | 29,45 mm <sup>2</sup>       |
|                   | Section of AA Wire   | 29,45 mm <sup>2</sup>       |
|                   | Section of AL Tube   | 25,66 mm <sup>2</sup>       |
|                   | Rated Tensile Strength (RTS)   | 46,2 kN                     |
|                   | Modulus of Elasticity (E-Modulus)  | 96,1 kN/mm <sup>2</sup>     |
|                   | Thermal Elongation Coefficient   | 17,1 x 10 <sup>-6</sup> /°C |
|                   | Permissible Maximum Working Stress (70% RTS)   | 32,3kN                      |
|                   | Everyday Stress (EDS) (16% RTS)  | 8,0kN                       |
|                   | DC Resistance  | 0,467 Ω/km                  |
|                   | Short Time Current (1s)  | 7,8 kA                      |
|                   | Short Time Current Capacity (20°C~200°C)   | 60,4 kA <sup>2</sup> s      |
|                   | Minimum Bending Radius   | Installation                |
| Operating         |  | 186 mm                      |
| Temperature Range | Installation   | -15°C ~ +50°C               |
|                   | Transportation and Operation   | -40°C ~ +80°C               |
| Span length       | Typical span length  | 400 mtr.                    |

Remarks: All Sizes and Values are Nominal values. Diameter Tolerance: ±1%, Weight Tolerance: ±2%

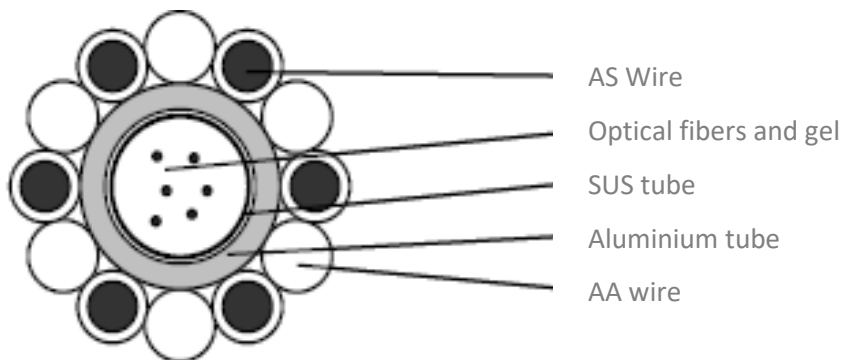


| OPGW Structure |         | Material      | No | Material   | No.     | Material Dia.  |         |
|----------------|---------|---------------|----|------------|---------|----------------|---------|
|                | Fiber   | G.652D        | 96 |            |         |                |         |
|                | US tube | SUS           | 1  |            |         | SUS outer dia. | 4,50 mm |
|                | Al-Tube |               | 1  | Inner dia. | 4,70 mm | Outer dia.     | 7,90 mm |
|                | Layer 1 | 20,3% AS wire | 7  | AA wire    | 4       | Diameter       | 3,00 mm |

### 5. Outer sheath

|                   |  |                             |
|-------------------|--|-----------------------------|
| Technical Data    | Acc. to IEC 60794-4-1, IEEE-1138 standards. Stranding direction of outer layer is right hand (Z-stranding) |                             |
|                   | Cable Diameter   | 13,90 mm                    |
|                   | Cable Weight   | 529 kg/km                   |
|                   | Supporting Cross Section   | 109,4 mm <sup>2</sup>       |
|                   | Section of AS Wire   | 49,48 mm <sup>2</sup>       |
|                   | Section of AA Wire   | 28,27 mm <sup>2</sup>       |
|                   | Section of AL Tube   | 31,67 mm <sup>2</sup>       |
|                   | Rated Tensile Strength (RTS)   | 71,3 kN                     |
|                   | Modulus of Elasticity (E-Modulus)  | 106,3 kN/mm <sup>2</sup>    |
|                   | Thermal Elongation Coefficient   | 16,1 x 10 <sup>-6</sup> /°C |
|                   | Permissible Maximum Working Stress (70% RTS)   | 456,2 N/mm <sup>2</sup>     |
|                   | Everyday Stress (EDS) (16%~25% RTS)  | 104,3~163,0 N/mm            |
|                   | DC Resistance  | 0,392 Ω/km                  |
|                   | Short Time Current (1s)  | 9,8 kA                      |
|                   | Short Time Current Capacity (20°C~200°C)   | 96,1 kA <sup>2</sup> s      |
|                   | Minimum Bending Radius   | Installation                |
| Operating         |  | 208 mm                      |
| Temperature Range | Installation   | -15°C ~ +50°C               |
|                   | Transportation and Operation   | -40°C ~ +80°C               |
| Span length       | Typical span length  | 700 mtr.                    |

Remarks: All Sizes and Values are Nominal values. Diameter Tolerance: ±1%, Weight Tolerance: ±2%











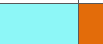










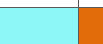





















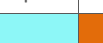



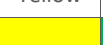


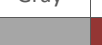

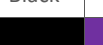

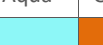

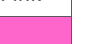

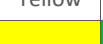

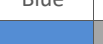
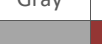

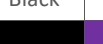



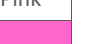








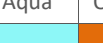










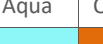

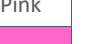








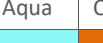










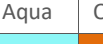









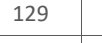

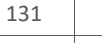
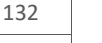











| OPGW Structure |         | Material      | No  | Material   | No.     | Material Dia.  |         |
|----------------|---------|---------------|-----|------------|---------|----------------|---------|
|                | Fiber   | G.652D        | 144 |            |         |                |         |
|                | US tube | SUS           | 1   |            |         | SUS outer dia. | 5,40 mm |
|                | Al-Tube |               | 1   | Inner dia. | 5,60 mm | Outer dia.     | 8,30 mm |
|                | Layer 1 | 20,3% AS wire | 6   | AA wire    | 6       | Diameter       | 2,80 mm |

|                        |  |                             |
|------------------------|--|-----------------------------|
| Technical Data         | Acc. to IEC 60794-4-1, IEEE-1138 standards. Stranding direction of outer layer is right hand (Z-stranding) |                             |
|                        | Cable Diameter   | 13,90 mm                    |
|                        | Cable Weight   | 428kg/km                    |
|                        | Supporting Cross Section   | 103,4 mm <sup>2</sup>       |
|                        | Section of AS Wire   | 36,95 mm <sup>2</sup>       |
|                        | Section of AA Wire   | 36,95 mm <sup>2</sup>       |
|                        | Section of AL Wire   | 29,48 mm <sup>2</sup>       |
|                        | Rated Tensile Strength (RTS)   | 60,0 kN                     |
|                        | Modulus of Elasticity (E-Modulus)  | 97,1 kN/mm <sup>2</sup>     |
|                        | Thermal Elongation Coefficient   | 17,0 x 10 <sup>-6</sup> /°C |
|                        | Permissible Maximum Working Stress (70% RTS)   | 406,2 N/mm <sup>2</sup>     |
|                        | Everyday Stress (EDS) (16%~25% RTS)  | 92,9~145,2 N/mm             |
|                        | DC Resistance  | 0,386 Ω/km                  |
|                        | Short Time Current (1s)  | 9,7 kA                      |
|                        | Short Time Current Capacity (20°C~200°C)   | 94,7 kA <sup>2</sup> s      |
| Minimum Bending Radius | Installation   | 278 mm                      |
|                        | Operating  | 208 mm                      |
| Temperature Range      | Installation   | -10°C ~ +50°C               |
|                        | Transportation and Operation   | -50°C ~ +80°C               |

Remarks: All Sizes and Values are Nominal values. Diameter Tolerance: ±1%, Weight Tolerance: ±2%



#### 4. Fiber color code scheme

|               |       |   |   |   |   |   |   |  |   |   |   |   |
|---------------|-------|---|---|---|---|---|---|--|---|---|---|---|
| White binder  | 1     | 2   | 3   | 4   | 5   | 6   | 7   | 8  | 9   | 10  | 11  | 12  |
|               | White | Red   | Yellow  | Green   | Blue  | Gray  | Brown   | Black  | Violet  | Aqua  | Orange  | Pink  |
|               |       |    |    |    |    |    |    |    |    |    |    |    |
| Red binder    | 13    | 14  | 15  | 16  | 17  | 18  | 19  | 20   | 21  | 22  | 23  | 24  |
|               | White | Red   | Yellow  | Green   | Blue  | Gray  | Brown   | Black  | Violet  | Aqua  | Orange  | Pink  |
|               |       |    |    |    |    |    |    |    |    |    |    |    |
| Yellow binder | 25    | 26  | 27  | 28  | 29  | 30  | 31  | 32   | 33  | 34  | 35  | 36  |
|               | White | Red   | Yellow  | Green   | Blue  | Gray  | Brown   | Black  | Violet  | Aqua  | Orange  | Pink  |
|               |       |    |    |    |    |    |    |    |    |    |    |    |
| Green binder  | 37    | 38  | 39  | 40  | 41  | 42  | 43  | 44   | 45  | 46  | 47  | 48  |
|               | White | Red   | Yellow  | Green   | Blue  | Gray  | Brown   | Black  | Violet  | Aqua  | Orange  | Pink  |
|               |       |    |    |    |    |    |    |    |    |    |    |    |
| Blue binder   | 49    | 50  | 51  | 52  | 53  | 54  | 55  | 56   | 57  | 58  | 59  | 60  |
|               | White | Red   | Yellow  | Green   | Blue  | Gray  | Brown   | Black  | Violet  | Aqua  | Orange  | Pink  |
|               |       |    |    |    |    |    |    |    |    |    |    |    |
| Gray binder   | 61    | 62  | 63  | 64  | 65  | 66  | 67  | 68   | 69  | 70  | 71  | 72  |
|               | White | Red   | Yellow  | Green   | Blue  | Gray  | Brown   | Black  | Violet  | Aqua  | Orange  | Pink  |
|               |       |    |    |    |    |    |    |    |    |    |    |    |
| Brown binder  | 73    | 74  | 75  | 76  | 77  | 78  | 79  | 80   | 81  | 82  | 83  | 84  |
|               | White | Red   | Yellow  | Green   | Blue  | Gray  | Brown   | Black  | Violet  | Aqua  | Orange  | Pink  |
|               |       |  |  |  |  |  |  |  |  |  |  |  |
| Black binder  | 85    | 86  | 87  | 88  | 89  | 90  | 91  | 92   | 93  | 94  | 95  | 96  |
|               | White | Red   | Yellow  | Green   | Blue  | Gray  | Brown   | Black  | Violet  | Aqua  | Orange  | Pink  |
|               |       |  |  |  |  |  |  |  |  |  |  |  |
| Violet binder | 97    | 98  | 99  | 100   | 101   | 102   | 103   | 104  | 105   | 106   | 107   | 108   |
|               | White | Red   | Yellow  | Green   | Blue  | Gray  | Brown   | Black  | Violet  | Aqua  | Orange  | Pink  |
|               |       |  |  |  |  |  |  |  |  |  |  |  |
| Aqua binder   | 109   | 110   | 111   | 112   | 113   | 114   | 115   | 116  | 117   | 118   | 119   | 120   |
|               | White | Red   | Yellow  | Green   | Blue  | Gray  | Brown   | Black  | Violet  | Aqua  | Orange  | Pink  |
|               |       |  |  |  |  |  |  |  |  |  |  |  |
| Orange binder | 121   | 122   | 123   | 124   | 125   | 126   | 127   | 128  | 129   | 130   | 131   | 132   |
|               | White | Red   | Yellow  | Green   | Blue  | Gray  | Brown   | Black  | Violet  | Aqua  | Orange  | Pink  |
|               |       |  |  |  |  |  |  |  |  |  |  |  |
| Pink binder   | 133   | 134   | 135   | 136   | 137   | 138   | 139   | 140  | 141   | 142   | 143   | 144   |
|               | White | Red   | Yellow  | Green   | Blue  | Gray  | Brown   | Black  | Violet  | Aqua  | Orange  | Pink  |
|               |       |  |  |  |  |  |  |  |  |  |  |  |

Other color code scheme are available on request.

## 5. Test Requirement for OPGW

### 5.1 General

There are different test series to assure the quality of OPGW

- Routine test (in-process testing according to internal quality plan)
- Factory acceptance test (FAT, witnessed by customer)
- Type test (only in case of a basic new design, repetition in exceptional cases)

OPGW tests shall be in accordance with applicable standards or agreements between purchaser and manufacturer.

Generally, the tests will be performed according IEC 60794-4-10. However, if necessary tests can be done according to IEEE Std1138.

#### **Type test**

Type test may be waived by submitting maker's certificate of the similar product performed in an internationally acknowledged independent test organization or laboratory. If type test should be performed, it will be carried out according to an extra type test procedure reached to an agreement between purchaser and manufacturer.

#### **Routine test**

The optical attenuation coefficient on all production cable lengths is measured according to IEC 60793-1-C1C (Back-scattering technique, OTDR). Standard single-mode fibers are measured at 1310nm and at 1550nm. Non-zero dispersion shifted single-mode (NZDS) fibers are measured at 1550nm.

#### **Factory test**

Factory acceptance test is carried out on one sample per order in the presence of the customer or his representative. The requirements for quality characteristics are determined by relevant standards and agreed quality plans.

### 5.2 Test items

The following table shows that the test items will be carried out according to corresponding references.

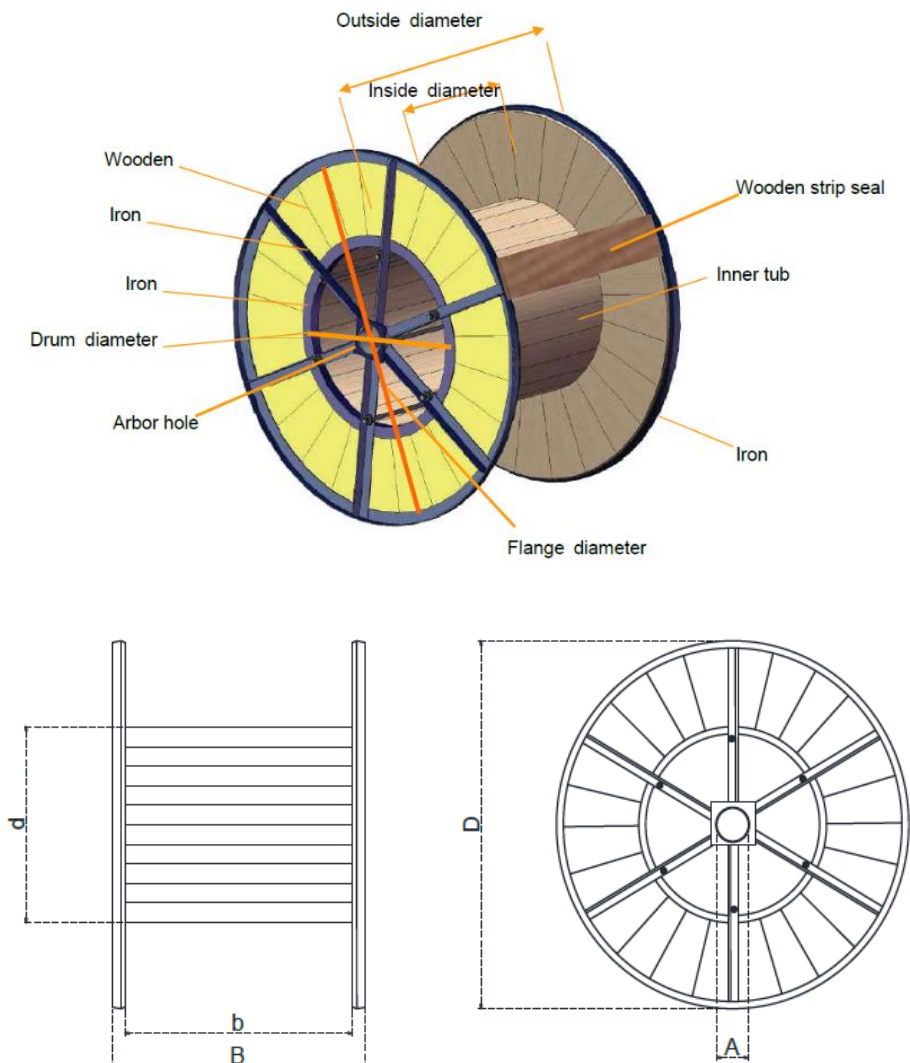
|  | <b>Routine</b> | <b>FAT</b> | <b>Type Test</b> | <b>Test Procedure</b> |
|--|----------------|------------|------------------|-----------------------|
| <b>Test on fibers</b>                    |                |            |                  | IEC 60793-1-45        |
| Mode field diameter                      |                |            |                  | IEC 60793-1-20        |
| Geometric parameter                      |                |            |                  | IEC 60793-1-40        |
| Attenuation (OTDR)                       | ●              | ●          |                  | IEC 60793-1-42        |
| Chromatic dispersion                     |                |            |                  | IEC 60793-1-44        |
| Cut-off wavelength (cable cut off)       |                |            |                  | IEC 60793-1-45        |
| <b>Test on wires before stranding</b>    |                |            |                  |                       |
| Diameter                                 | ●              | ●          |                  | IEC 61232/IEC 60104   |
| Tensile strength                         | ●              | ●          |                  | IEC 61232/IEC 60104   |
| Stress at 1% extension (Only ACS wire)   | ●              | ●          |                  | IEC 61232             |
| Elongation at break                      | ●              | ●          |                  | IEC 61232/IEC 60104   |
| Wrapping test (Only AA wire)             | ●              | ●          |                  | IEC 60104             |
| Conductivity                             | ●              | ●          |                  | IEC 61232/IEC 60104   |
| Thickness of Al-cladding (Only ACS wire) | ●              | ●          |                  | IEC 61232             |
| Torsion Test                             | ●              | ●          |                  | IEC 61232             |
| <b>Tests on OPGW</b>                     |                |            |                  |                       |
| Quality on surface                       | ●              | ●          |                  | IEC 60794-4-10        |
| Direction of outer lay                   | ●              | ●          |                  | 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 |

Note! The mark “●” means different test items which belongs to different test series

### 6. Packing and Drum

OPGW shall be wound round a non-returnable wooden drum or iron-wooden 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 weatherproof material on the outsides of drum according to customer's requirement



| Cable Diameter<br>(mm) | Drum Length<br>(mtr) | Drum Dimensions & Weights |    |     |    |          |        |
|------------------------|----------------------|---------------------------|----|-----|----|----------|--------|
|                        |                      | D                         | b  | B   | d  | A        | Weight |
|                        |                      | cm                        | cm | cm  | cm | cm       | kg     |
| 10,5~11,0              | 2000                 | 120                       | 90 | 110 | 80 | 10,5±0,5 | 150    |
|                        | 3000                 | 120                       | 90 | 110 | 80 | 10,5±0,5 | 150    |
|                        | 4000                 | 130                       | 90 | 110 | 80 | 10,5±0,5 | 170    |
|                        | 5000                 | 140                       | 90 | 110 | 80 | 10,5±0,5 | 190    |
|                        | 8000                 | 150                       | 90 | 110 | 80 | 10,5±0,5 | 220    |
| 12,0~12,5              | 2000                 | 120                       | 90 | 110 | 80 | 10,5±0,5 | 150    |
|                        | 3000                 | 130                       | 90 | 110 | 80 | 10,5±0,5 | 170    |
|                        | 4000                 | 140                       | 90 | 110 | 80 | 10,5±0,5 | 190    |
|                        | 5000                 | 150                       | 90 | 110 | 80 | 10,5±0,5 | 210    |
|                        | 8000                 | 180                       | 90 | 110 | 80 | 10,5±0,5 | 240    |
| 13,0~13,5              | 2000                 | 130                       | 90 | 110 | 80 | 10,5±0,5 | 170    |
|                        | 3000                 | 140                       | 90 | 110 | 80 | 10,5±0,5 | 190    |
|                        | 4000                 | 150                       | 90 | 110 | 80 | 10,5±0,5 | 210    |
|                        | 5000                 | 160                       | 90 | 110 | 80 | 10,5±0,5 | 240    |
|                        | 8000                 | 160                       | 90 | 110 | 80 | 10,5±0,5 | 260    |
| 13,5~14,0              | 7500                 | 180                       | 90 | 110 | 90 | 10,5±0,5 | 270    |

#### Varenummer

| Elnr.   | Varenummer            | Elnr.   | Varenummer              |
|---------|-----------------------|---------|-------------------------|
| 1000991 | G48-9/125 OPGW-AST-65 | 1000994 | G96-9/125 OPGW-AST-109  |
| 1000992 | G48-9/125 OPGW-AST-81 | 1000995 | G144-9/125 OPGW-AST-103 |
| 1000993 | G96-9/125 OPGW-AST-84 |         |                         |