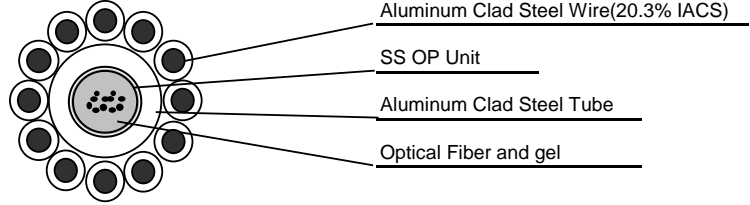


	<b>OPGW Cable Specifications</b>	<b>Serial No:</b> HC2018-04-030
		<b>Bid No:</b>

**Cable Type:** OPGW - 96B4- ( AA/AS 37/74 -92,2 )

**Cross Section:**



Structure:	Material		No		Material Dia.	
	Fiber	G.652D	96			
SS-Tube	SS	1			Outer Dia.	4,70 mm
Al-Tube	Al	1	Inner-Dia.	4,70	Outer Dia.	8,30 mm
Layer1	20.3% AS wire	12	AA wire	0	Diameter	2,80 mm

<b>Technical Data:</b>	According to IEC60794-4-1, IEEE-1138 standards	
	Stranding direction of outer layer is right hand (Z-stranding)	
	Stranded:Core and layer1 greased	No
	Cable Diameter	13,9 mm
	Cable Weight	630 kg/km
	Supporting Cross Section	110,6 mm <sup>2</sup>
	Section of AS Wire	73,9 mm <sup>2</sup>
	Section of Al. Part	36,8 mm <sup>2</sup>
	Ultimate Tensile Strength (UTS)	101,1 kN
	Rated Tensile Strength (RTS)	96 kN
	Modulus of Elasticity (E-Modulus)	126,8 kN/mm <sup>2</sup>
	Thermal Elongation Coefficient	14,5 10 <sup>-6</sup> /°C
	Permissible Maximum Working Stress (40% RTS )	38kN 347 N/mm <sup>2</sup>
	Everyday Stress ( EDS) ( 20% RTS )	19kN 174 N/mm <sup>2</sup>
	Ultimate Exceptional Stress (65% RTS )	62kN 564 N/mm <sup>2</sup>
	Max. DC Resistance at 20°C	0,467 Ω /km
	Short Time Current (0,5s, 20°C~180°C)	13,58 kA
	Short Circuit Current Capacity I <sup>2</sup> t	92,2 kA <sup>2</sup> s
	Minimum Bending Radius Installation	278 mm
	Minimum Bending Radius Operation	208 mm
Ratio of RTS to weight	15,5 km	
<b>Temperature Range:</b>	Installation	-10°C ~ +50 °C
	Transportation and Operation	-40°C ~ +80 °C

Remarks: All Sizes and Values are Nominal Values

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### Fiber Specification:

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:

#### G.652D Fiber in cable

Category	Description	Specifications	
		Before cabling	After cabling
<b>Optical Specifications</b>	Attenuation @1310 nm	≤0.34 dB/km	≤0.37 dB/km
	Attenuation @1383 nm	≤0.33 dB/km	≤0.36 dB/km
	Attenuation @1550 nm	≤0.20 dB/km	≤0.24 dB/km
	Attenuation @1625 nm	≤0.23dB/km	≤0.25 dB/km
	Zero Dispersion Wavelength	1300~1324 nm	
	Zero Dispersion Slope	≤ 0.092 ps/nm <sup>2</sup> .km	
	PMD Link value (M=20cables Q=0.01% ) maximum PMD <sub>Q</sub>	0.1 ps/√km	
	Cable Cutoff Wavelength (λ <sub>cc</sub> )	≤1260 nm	
	Macro bending Loss (100 turns; Φ50 mm) @1550 nm (100 turns; Φ50 mm) @1625 nm	≤ 0.05 dB ≤ 0.10 dB	
	Mode Field Diameter @1310 nm	9.2±0.4μm	
<b>Dimensional Specifications</b>	Cladding Diameter	125 ±0.7μm	
	Core/clad concentricity error	≤0.5μm	
	Cladding Non-Circularity	≤1.0%	
<b>Mechanical Specifications</b>	Proof stress	≥0.69Gpa	

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**Color Coding System  
for 96 G.652D Optical Fibres acc. To ITU-T G.652**

**Fiber color coding**

1 2 3 4 5 6 7 8 9 10 11 12  
 Blue,orange,green,brown,grey,white,red,naturel,yellow, violet,pink,aqua  
 13 14 15 16 17 18 19 20 21 22 23 24  
 Blue,orange,green,brown,grey,white,red,naturel,yellow, violet,pink,aqua(\*)  
 (\*) With one black ring mark at regular interval.

**Group/Binder**  
 1 / Blue

1 2 3 4 5 6 7 8 9 10 11 12  
 Blue,orange,green,brown,grey,white,red,naturel,yellow, violet,pink,aqua  
 13 14 15 16 17 18 19 20 21 22 23 24  
 Blue,orange,green,brown,grey,white,red,naturel,yellow, violet,pink,aqua(\*)  
 (\*) With one black ring mark at regular interval.

2 / Orange

1 2 3 4 5 6 7 8 9 10 11 12  
 Blue,orange,green,brown,grey,white,red,naturel,yellow, violet,pink,aqua  
 13 14 15 16 17 18 19 20 21 22 23 24  
 Blue,orange,green,brown,grey,white,red,naturel,yellow, violet,pink,aqua(\*)  
 (\*) With one black ring mark at regular interval.

3 / Green

1 2 3 4 5 6 7 8 9 10 11 12  
 Blue,orange,green,brown,grey,white,red,naturel,yellow, violet,pink,aqua  
 13 14 15 16 17 18 19 20 21 22 23 24  
 Blue,orange,green,brown,grey,white,red,naturel,yellow, violet,pink,aqua(\*)  
 (\*) With one black ring mark at regular interval.

4 / Brown

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## TEST REQUIREMENTS FOR OPGW

### 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.

As a general rule 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.

### **Test items**

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

	<b>OPGW Cable Specifications</b>	<b>Serial No:</b>	HC2015-02-007
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	<b>Routine</b>	<b>FAT</b>	<b>Type Test</b>	<b>Test Procedure</b>
<b>Test on fibers</b>				
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
<b>Test on wires before stranding</b>				
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/ IEC60104
Torsion test (Only ACS wire)	●	●		IEC61232
<b>Tests on OPGW</b>				
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

**Notes: The mark "●" means different test items which belongs to different test series.**