

ZTT GROUP

Established in 1992, ZTT started from optical fiber communications and was listed on Shanghai Stock Exchange (SSE) in 2002 (Stock Code in SSE: 600522). ZTT has pictured a diversified industrial portfolio for marine equipment, renewable energy, new materials, smart grid, optical communications and other diversified industrial products. ZTT Group is now hosting 80 subsidiary companies and over 16,000 employees, operating 5 overseas plants located in India, Brazil, Indonesia, Morocco and Turkey. ZTT owns more than 2500 patents with independent intellectual property rights, presided over or participated in more than 500 international and national industry standards. The products of ZTT are exported to 160 countries and regions. The company has ranked among the top 500 Chinese enterprises for consecutive years and broke through \$ 12.5 billion in sales revenue in 2021. ZTT follows the new economic model of fostering cleaner production and accelerating green and low-carbon development, works hard to serve as the pioneer of persistent endeavor to achieve national goal involving carbon dioxide emissions peaking by 2030 and carbon neutrality by 2060, emerging as a green manufacturing technology group assuming regional economy.



OPGW / OPPC / ADSS



Your Partner in Cable



ZTT is specialized in research, development, production, marketing, service and support of special optical fiber cables for electrical power lines, e.g. OPGW, OPPC, ADSS and stainless steel tube series for sensor and detector.

ZTT establishes the largest OPGW manufacturing base in the world. It is the one who first imported 6 world-level first-class complete stainless steel tube production lines, 4 world-level loose tube stranded aluminum tube production lines and 20 world-level special OPGW cage stranding production lines. It forms about 70,000km annual output and becomes a professional company which has the biggest OPGW output and satisfies different customers' requirements with quickest delivery time.

The OPGW, OPPC, ADSS and other special power optic cables provided by ZTT are comprehensively used in optical fiber communication industry of power grid net work and telecommunication. Furthermore, the cables, which its total amount is over 680,000km, have been sold to more than 130 countries and regions, such as India, Pakistan, Thailand, Saudi Arabia, Kazakhstan, Poland, Chile, Ethiopia and so on. The research and application of OPGW, OPPC and other special power optic cables are in a leading position in the world. It has made such many new technical records as large cross-section, big cores, large capacity, long span, ice resistance, sand, lightning resistance and ultra high voltage.

ZTT will consistently serve the telecommunication and power grid industry relying on its sales & services network in China and all over the world.

Type of Special optical fiber cables for electrical power lines

Fiber-Optical Aerial Cables

- OPGW (Optical Fiber Composite Overhead Ground Wire)

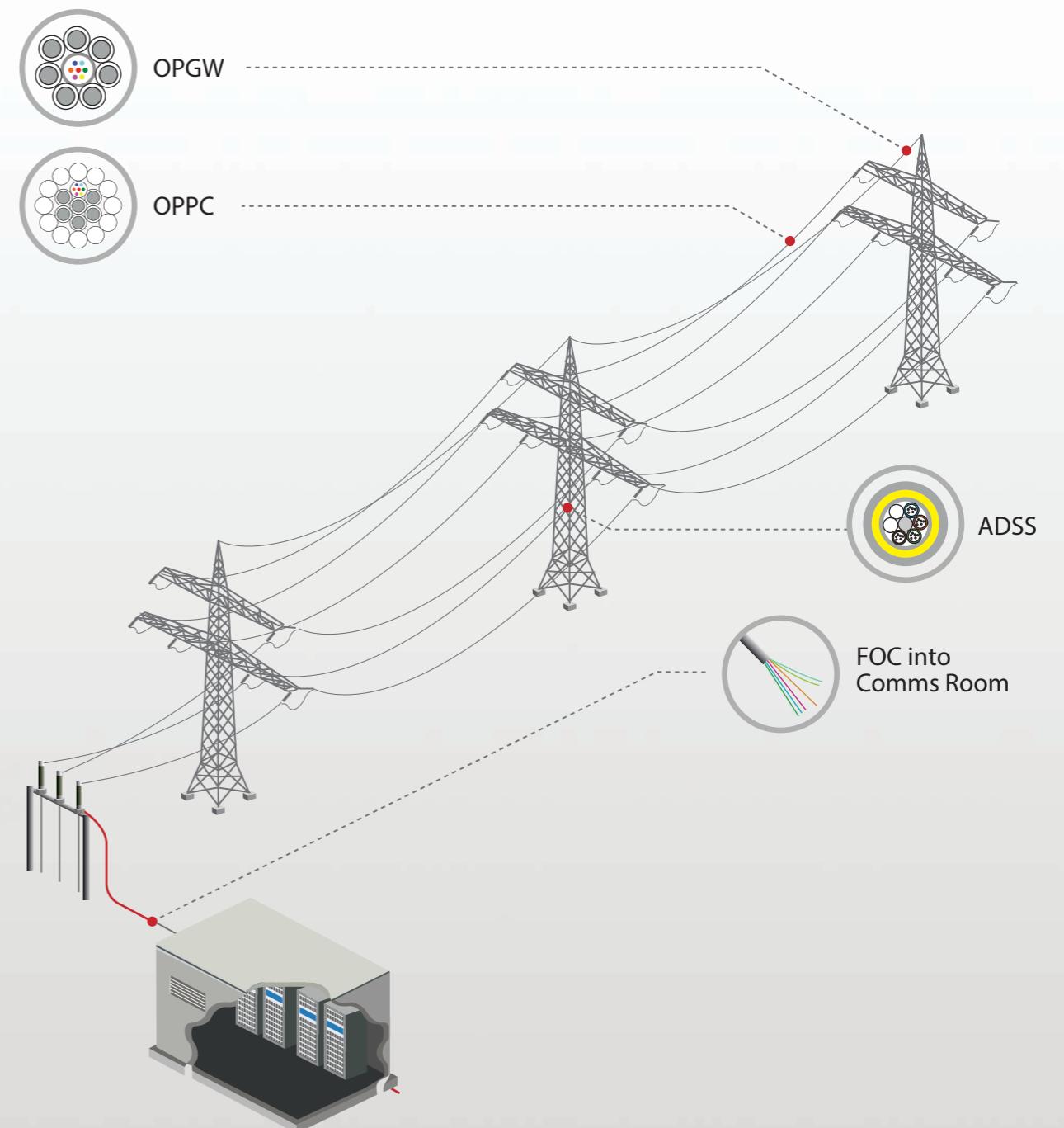
OPGW cables have the dual functions of ground wire with communication capabilities.

- OPPC (Optical Fiber Composite Phase Conductor)

OPPC cables have the dual functions performance functions of phase conductors with communication capabilities.

- ADSS (all-dielectric self-supported cable)

ADSS cables are a kind of non-metal optical fiber cables suspended directly between two points without any supporting elements.

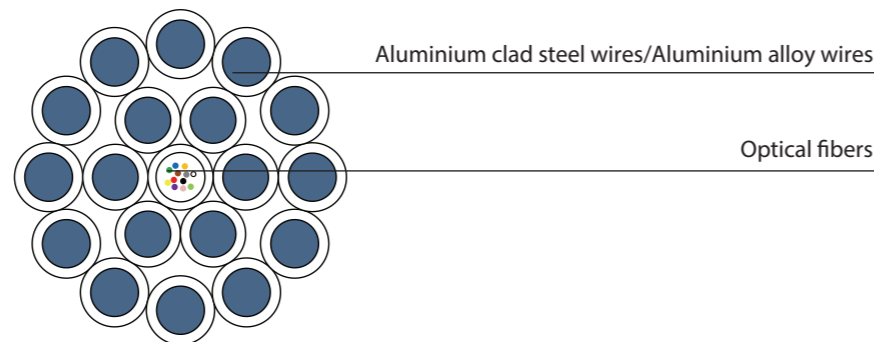
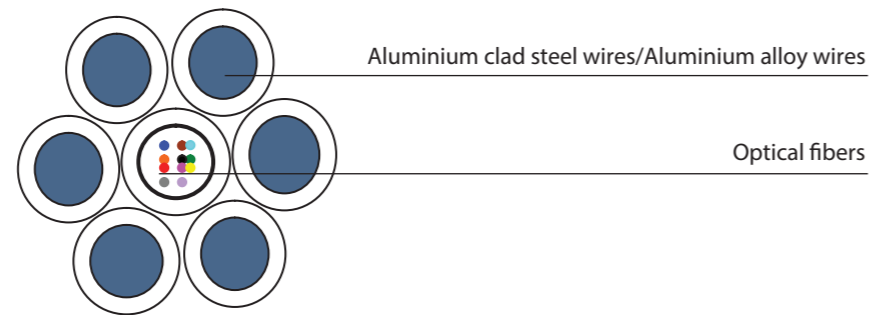


Typical Designs of Central Stainless Steel Tube OPGW



Central Tube OPGW Single/Double Armour layers

The central stainless steel tube is surrounded by single or double layers of aluminium clad steel wires(ACS) or mix ACS wires and aluminium alloy wires.



Characteristic and Application

- Small cable diameter and short-circuit current capacity, light weight.
- The stainless steel tube can form a suitable primary fiber excess length.
- The OPGW has slightly worse tensile, torsion and crush resistance performance.
- Apply to the transformation of old lines.

Typical Parameters:

Single Layer

ZTT Standard	Fiber Count(Max)	Diameter (mm)	Weight (kg/km)	RTS (kN)	Short Circuit (kA ² s)
OPGW-32[40.6;4.7]	12	7.8	243	40.6	4.7
OPGW-42[54.0;8.4]	24	9.0	313	54.0	8.4
OPGW-42[43.5;10.6]	24	9.0	284	43.5	10.6
OPGW-54[67.8;13.9]	36	10.2	394	67.8	13.9
OPGW-54[55.9;17.5]	36	10.2	356	55.9	17.5
OPGW-61[73.7;17.5]	48	10.8	438	73.7	17.5
OPGW-61[55.1;24.5]	48	10.8	358	55.1	24.5
OPGW-68[80.8;21.7]	54	11.4	485	80.8	21.7
OPGW-75[63.0;36.3]	60	12.0	459	63.0	36.3
OPGW-76[54.5;41.7]	60	12.0	385	54.5	41.7
OPGW-79[51.2;49.5]	72	12.3	403	51.2	49.5

Double Layers

ZTT Standard	Fiber Count(Max)	Diameter (mm)	Weight (kg/km)	RTS (kN)	Short Circuit (kA ² s)
OPGW-96[121.7;42.2]	12	13.0	671	121.7	42.2
OPGW-127[141.0;87.9]	24	15.0	825	141.0	87.9
OPGW-127[77.8;128.0]	24	15.0	547	77.8	128.0
OPGW-145[121.0;132.2]	28	16.0	857	121.0	132.2
OPGW-163[138.2;183.6]	36	17.0	910	138.2	183.6
OPGW-163[99.9;213.7]	36	17.0	694	99.9	213.7
OPGW-183[109.7;268.7]	48	18.0	775	109.7	268.7
OPGW-183[118.4;261.6]	48	18.0	895	118.4	261.6

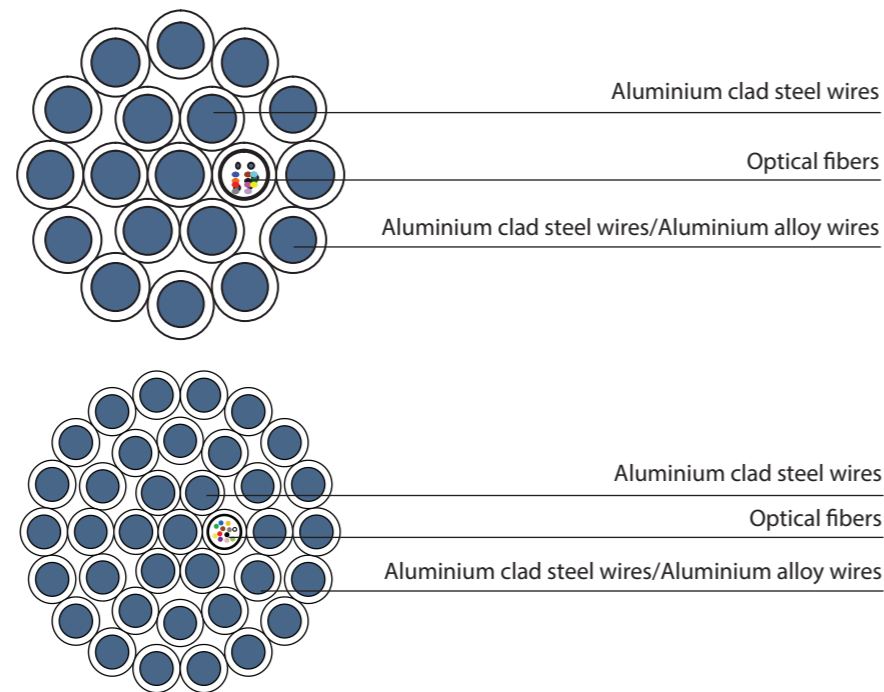
* The above designs are ZTT's typical options, and ZTT can provide any specific cable according to your requirement.

Typical Designs of Stranded Stainless Steel Tube OPGW



OPGW With Stranded Layers, Single Tube And Multitube Are Available
Double /Three Armour Layers

The stainless steel tube is stranded by double or three layers of aluminium clad steel wires(ACS) or mix ACS wires and aluminium alloy wires.



Characteristic and Application

- larger cable diameter and much more fiber count.
- larger tensile strength and fault current capacity to reach a better balance of electrical and mechanical performance.
- The amount of Stainless Steel Tube could be 1, 2 or 3 (max. at present).
- Optimum stranding design to reach a suitable secondary fiber excess length.
- The stranded layers could be double layers or three layers, the stranded wires could be AS wires with/or AA and AI wires.

Typical Parameters:

Double Layers

ZTT Standard	Fiber Count(Max)	Diameter (mm)	Weight (kg/km)	RTS (kN)	Short Circuit (kA ² s)
OPGW-89[55.4;62.9]	24	12.6	381	55.4	62.9
OPGW-91[53.6;66.4]	24	12.7	377	53.6	66.4
OPGW-110[90.0;86.9]	24	14.0	600	90.0	86.9
OPGW-104[64.6;85.6]	28	13.6	441	64.6	85.6
OPGW-127[79.0;129.5]	36	15.0	537	79.0	129.5
OPGW-137[85.0;148.5]	36	15.6	575	85.0	148.5
OPGW-145[98.6;162.3]	48	16.0	719	98.6	162.3
OPGW-164[100.2;214.8]	48	17.1	687	100.2	214.8
OPGW-120[70.0;117.6]	72	15.0	509	70.0	117.6
OPGW-137[79.7;152.2]	96	16.0	574	79.7	152.2
OPGW-174[98.6;246.5]	128	18.2	724	98.6	246.5

Three Layers

ZTT Standard	Fiber Count(Max)	Diameter (mm)	Weight (kg/km)	RTS (kN)	Short Circuit (kA ² s)
OPGW-232[343.0;191.4]	28	20.15	1696	343.0	191.4
OPGW-254[116.5;554.6]	36	21.0	889	116.5	554.6
OPGW-347[366.9;687.7]	48	24.7	2157	366.9	687.7
OPGW-282[358.7;372.1]	96	22.5	1938	358.7	372.1

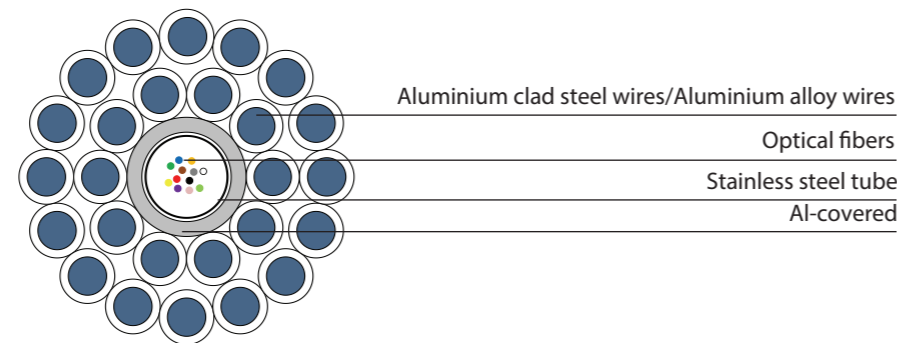
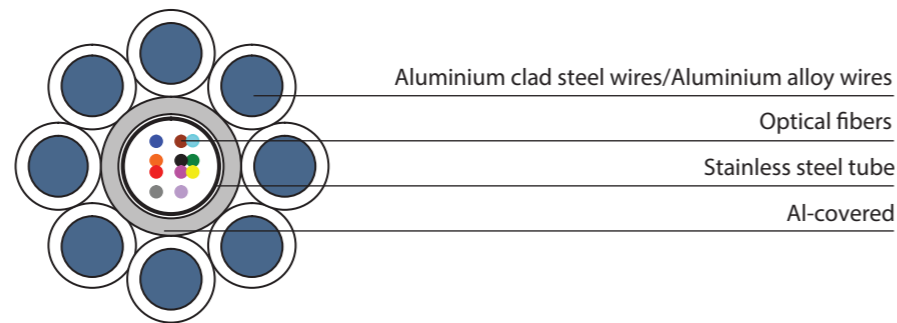
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Typical Designs of Central Al-covered Stainless Steel Tube OPGW



Central Al-covered stainless steel tube OPGW Single/Double Armour Layers

The central Al-covered steel tube is surrounded by single or double layers of aluminium clad steel wires(ACS) or mix ACS wires and aluminium alloy wires.



Characteristic and Application

- Al-covered Stainless Steel tube design increases the cross section of AL, to reach a better fault current and lightning resistance performance.
- Good anti-corrosion performance.
- Apply to the transmission line which requires small diameter and large fault current.

Typical Parameters:

Single Layer

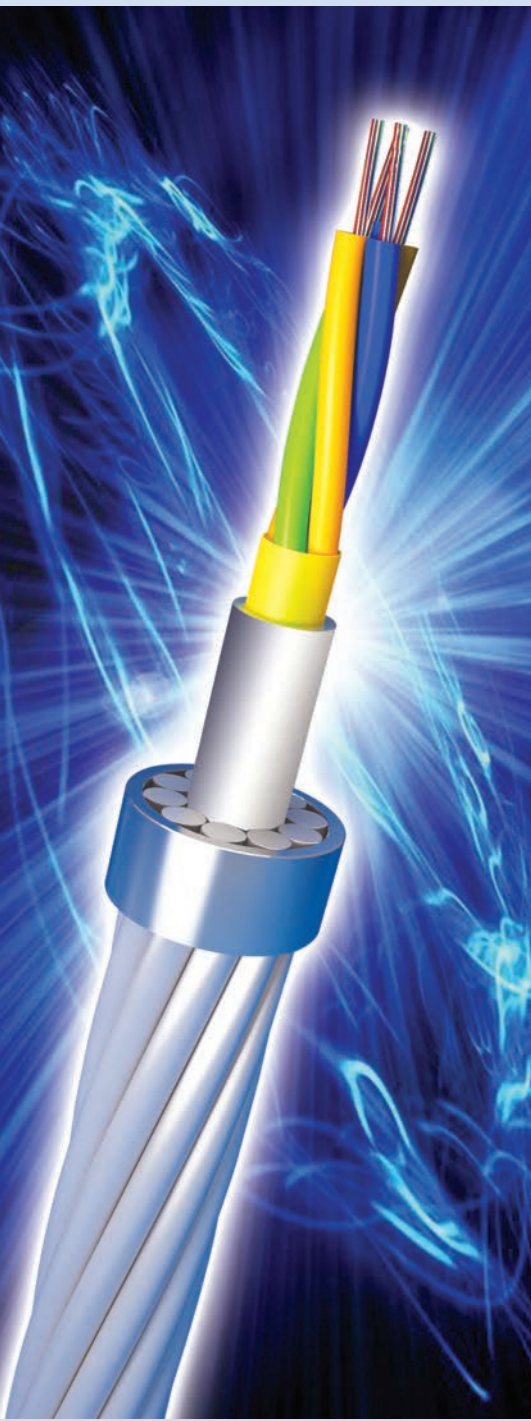
ZTT Standard	Fiber Count(Max)	Diameter (mm)	Weight (kg/km)	RTS (kN)	Short Circuit (kA ² s)
OPGW-78[78.7;37.6]	24	11.6	498	78.7	37.6
OPGW-77[63.6;41.6]	28	11.6	451	63.6	41.6
OPGW-77[78.6;36.2]	28	11.6	496	78.6	36.2
OPGW-111[58.9;103.7]	48	13.8	511	58.9	103.7
OPGW-187[75.3;308.2]	48	18.0	679	75.3	308.2
OPGW-81[63.2;46.7]	48	11.9	458	63.2	46.7
OPGW-74[68.5;36.4]	60	11.4	444	68.5	36.4
OPGW-84[42.4;59.9]	60	12.1	383	42.4	59.9
OPGW -95 [95.8;54.8]	72	13.2	597	95.8	54.8
OPGW - 131 [65.9;146.4]	72	15.2	593	65.9	146.4
OPGW -90 [90.0;50.6]	96	13.0	563	90.0	50.6
OPGW - 144 [110.3;150.8]	96	15.8	781	110.3	150.8

Double Layers

ZTT Standard	Fiber Count(Max)	Diameter (mm)	Weight (kg/km)	RTS (kN)	Short Circuit (kA ² s)
OPGW-191[110.8;296.0]	24	18.0	809	110.8	296.0
OPGW-146[84.3;172.0]	28	15.8	625	84.3	172.0
OPGW-146[72.7;177.4]	28	15.8	591	72.7	177.4
OPGW-199[115.3;322.2]	48	18.4	845	115.3	322.2
OPGW-226[128.6;414.2]	60	19.7	954	128.6	414.2
OPGW -166 [96.2;224.8]	72	17.1	778	96.2	224.8
OPGW -203 [118.7;336.1]	96	19.0	959	118.7	336.1

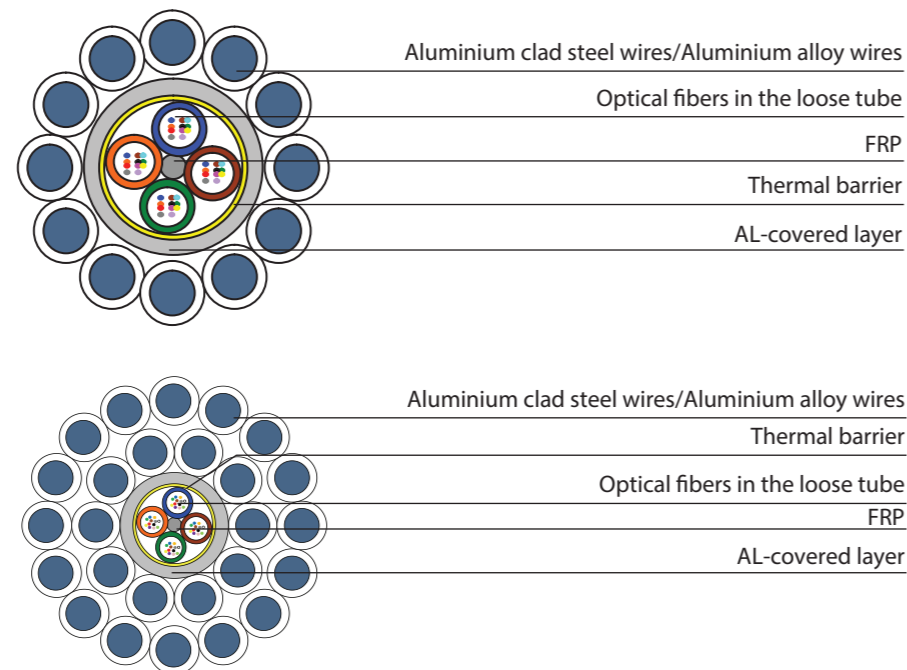
* The above designs are ZTT's typical options, and ZTT can provide any specific cable according to your requirement.

Typical Designs of Aluminum Tube OPGW



Aluminium tube OPGW Single/Double Armour Layers

The Aluminium tube is surrounded by single or double layers of aluminium clad steel wires(ACS) or mix ACS wires and aluminium alloy wires.



Characteristic and Application

- Good anti-corrosion performance.
- Material and structure are uniform, good resistance to vibration fatigue.
- Short circuit current has small effect on the optical fiber transmission properties.
- Good anti-lightning performance.

Typical Parameters:

Single Layer

ZTT Standard	Fiber Count(Max)	Diameter (mm)	Weight (kg/km)	RTS (kN)	Short Circuit (kA ² s)
OPGW-81[73.9;43.6]	24	12.5	488	73.9	43.6
OPGW-86[76.8;49.5]	24	12.8	510	76.8	49.5
OPGW-103[93.8;68.9]	24	13.8	611	93.8	68.9
OPGW-85[76.8;46.8]	32	12.8	509	76.8	46.8
OPGW-85[50.5;54.5]	32	12.8	445	50.5	54.5
OPGW-112[106.7;80.0]	36	14.7	688	106.7	80.0
OPGW-112[86.0;90.3]	48	14.7	627	86.0	90.3
OPGW-112[62.7;104.5]	48	14.7	498	62.7	104.5
OPGW-122[65.6;123.9]	48	15.2	534	65.6	123.9
OPGW-132[121.0;108.7]	60	16.0	810	121.0	108.7
OPGW-132[63.9;148.0]	60	16.0	545	63.9	148.0
OPGW-135 [99.8;132.2]	72	16.3	751	99.8	132.2
OPGW-146 [109.0;154.9]	96	17.1	813	109.0	154.9

Double Layers

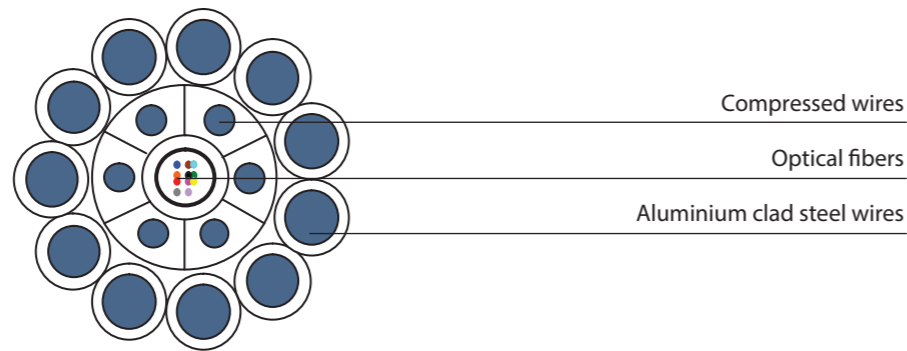
ZTT Standard	Fiber Count(Max)	Diameter (mm)	Weight (kg/km)	RTS (kN)	Short Circuit (kA ² s)
OPGW-174[101.0;247.7]	24	17.7	744	101.0	247.7
OPGW-244[141.2;479.7]	24	20.7	1030	141.2	479.7
OPGW-249[147.0;501.4]	48	21.1	1065	147.0	501.4
OPGW-207[121.8;348.1]	48	19.4	892	121.8	348.1
OPGW-233[135.8;441.9]	60	20.6	999	135.8	441.9
OPGW-289 [166.4;675.0]	72	22.9	1246	166.4	675.0
OPGW-314 [158.7;826.4]	96	24.0	1277	158.7	826.4

* The above designs are ZTT's typical options, and ZTT can provide any specific cable according to your requirement.

Typical Designs of Lightning Resistant Central Stainless Steel Tube OPGW with Compressed Wires



The central stainless steel tube is surrounded by double layers of aluminium clad steel wires(ACS),the inner layer aluminium clad steel wires are compressed,the outer layer aluminium clad steel wires are all compressed or all round.



Characteristic and Application

- Compressing round AS wires into sector AS wires during stranding.
- Compared with round AS wires stranding, sector AS wires stranding can increase the cross section and fault current capacity while the cable diameter is the same.
- Compared with round AS wires stranding, sector AS wires stranding can dramatically increase the diameter of outer wires to enhance the lightning performance.
- Apply to the transmission line which requires small diameter and large fault current.
- Apply to heavy thunderstorm areas.

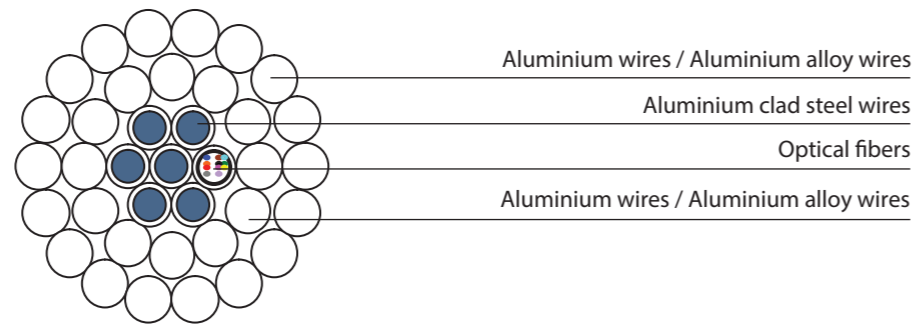
Typical Parameters:

ZTT Standard	Fiber Count(Max)	Diameter (mm)	Weight (kg/km)	RTS (kN)	Short Circuit (kA ² s)
OPGW-YS/138-147.9	30	15.2	680	89.0	147.9
OPGW-YS/159-196.3	30	16.2	780	102.5	196.3
OPGW-YS/115-97.1	36	14.0	610	81.3	97.1
OPGW-YS/128-121.0	36	14.8	671	89.8	121.0
OPGW-YS/150-168.1	36	16.0	777	104.2	168.1
OPGW-YS/132-135.2	48	15.0	652	85.1	135.2
OPGW-YS/151-177.0	48	16.0	742	97.4	177.0
OPGW-YS/133-138.1	48	15.0	658	86.0	138.1
OPGW-YS/145-164.3	48	15.7	716	93.8	164.3

* The above designs are ZTT's typical options,and ZTT can provide any specific cable according to your requirement.

Typical Designs of OPPC

The Aluminium tube is surrounded by single or double layers of aluminium clad steel wires(ACS) or mix ACS wires and aluminium alloy wires.



Characteristic and Application

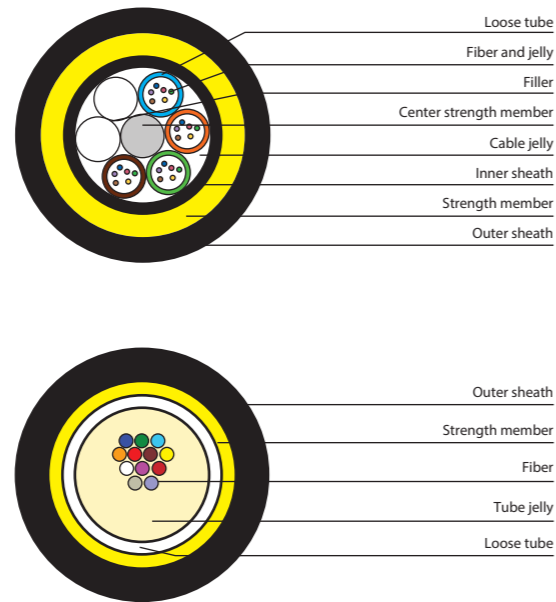
- Replacing one or several wires of the traditional conductor with stainless steel tube and strand the tube with AS/steel wires and AL/AA wires.
- Replacing one of the three phase conductors with OPPC, thus to form a transmission line which consists of one OPPC and two phase conductors.
- Mechanical and electrical performance can match the adjacent two phase conductors.
- OPPC can meet durative high temperature resistant which verified by Temperature Cycling test and Short Current test.
- OPPC is applied to middle & high voltage power lines without ground wires such as 10kV, 35kV, 66kV and so on.
- Telecommunications for middle & high voltage power lines in urban and rural areas; Providing optical cables for building distribution automation station.

Typical Parameters:

ZTT Standard	Fiber Count(Max)	Diameter (mm)	weight (kg/km)	RTS (kN)	Current Carrying Capacity(A)		
					40-70°C	40-80°C	40-90°C
OPPC-70/10	16	11.75	281	24.3	216	262	299
OPPC-110/25	16	15.4	494	45.7	299	364	418
OPPC-150/25	16	17.4	598	52.8	351	430	495
OPPC-185/25	16	19.0	695	58.5	395	486	561
OPPC-70/40	24	13.6	460	57.7	234	284	325
OPPC-95/20	24	14.0	402	37.0	264	321	368
OPPC-85/20	24	13.5	376	34.4	254	308	353
OPPC-120/25	24	15.9	523	49.0	308	376	432
OPPC-150/35	24	17.6	641	64.5	348	427	492
OPPC-210/35	24	20.4	812	74.3	424	524	605
OPPC-185/45	28	19.65	797	79.6	398	491	567
OPPC-230/40	36	21.8	949	87.7	455	563	652
OPPC-240/55	48	22.5	1037	102.5	467	580	672
OPPC-90/50	48	16.1	651	82.0	281	344	395

**The above designs are ZTT's typical options, and ZTT can provide any specific cable according to your requirement.*

All-dielectric Self-supporting Aerial Installation Cable —ADSS



Characteristic and Application

- ADSS are mainly installed at existing 220kV or lower voltage power lines.
- Layer or central tube design.
- Aramid yarn is used as the strength member to assure the tensile and strain performance, and Du Pont is our only partner.
- Outer sheath can be classified into PE and Tracking resistance PE to correspond the space potential below and more than 12kV.
- ADSS(stranded layer type)maximum fiber count: 312.
- ADSS(stranded layer type)maximum span can be up to 1500m.

Typical Parameters:

Stranded Layer Type

ZTT Standard	Weather conditions	Max Span (m)	RTS (kN)	MAT (kN)	Crush (N/10cm)	Weight(kg/km)		Diameter (mm)
						PE	AT	
ADSS-24B1-100m	Temperature range: -40~+70°C Max.ice thickness: 5mm Max wind speed: 25m/s	100	8.5	3.4	2200	124	133	11.6
ADSS-24B1-200m		200	15.3	6.1	2200	131	139	12.0
ADSS-24B1-300m		300	20.4	8.2	2200	136	145	12.3
ADSS-24B1-400m		400	25.5	10.2	2200	141	150	12.5
ADSS-24B1-500m		500	30.6	12.2	2200	146	156	12.8
ADSS-24B1-600m		600	39.1	15.6	2200	166	176	13.8
ADSS-24B1-700m		700	45.9	18.4	2200	179	190	14.2
ADSS-24B1-800m		800	52.7	21.1	2200	186	197	14.5
ADSS-24B1-900m		900	59.5	23.8	2200	192	204	14.8
ADSS-24B1-1000m		1000	66.3	26.5	2200	197	209	15.1
ADSS-24B1-1100m		1100	71.4	28.6	2200	202	214	15.3
ADSS-24B1-1200m		1200	76.5	30.6	2200	215	226	15.5
ADSS-24B1-1500m		1500	90.0	36.0	2200	230	245	16.1

Central Tube Type

ZTT Standard	Weather conditions	Max Span (m)	RTS (kN)	MAT (kN)	Crush (N/10cm)	Weight(kg/km)		Diameter (mm)
						PE	AT	
ADSS-X-24B1-50m	Temperature range: -40~+70°C Max.ice thickness: 5mm Max wind speed: 25m/s	50	5.0	2.0	2200	55	59	8.0
ADSS-X-24B1-100m		100	7.5	3.0	2200	57	61	8.2
ADSS-X-24B1-200m		200	12.5	5.0	2200	65	70	8.6

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SA8000 Certificates

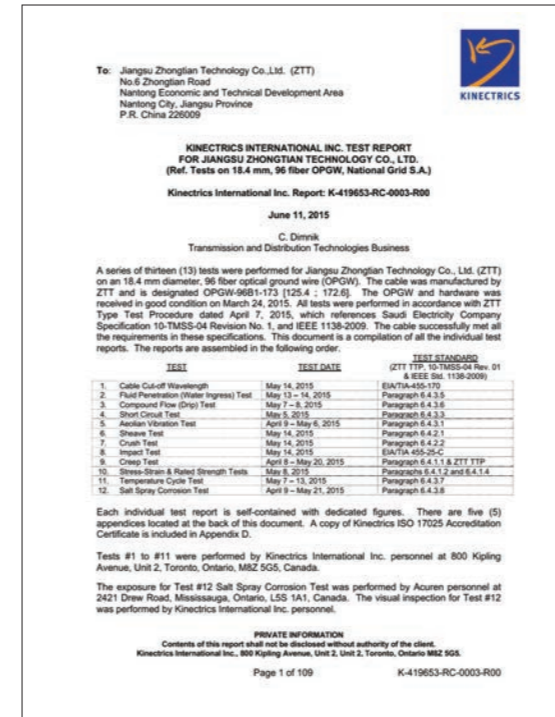


ISO Certificates

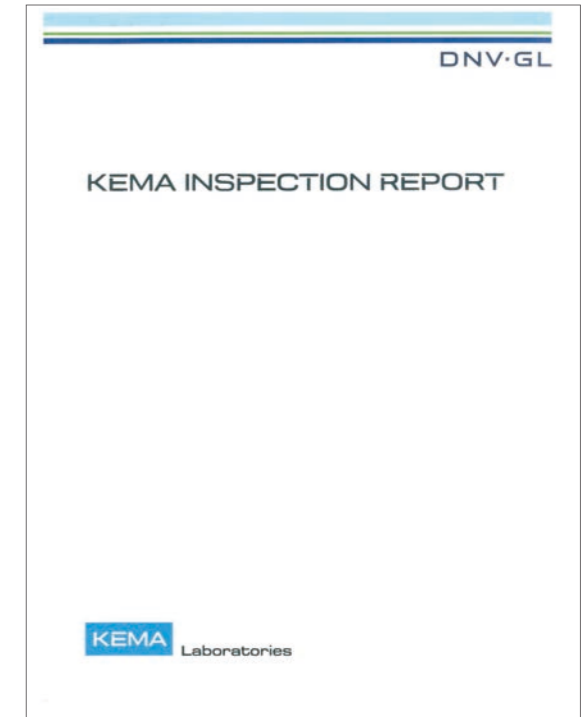


ZTT has established a complete, advanced quality inspection center of controlling raw materials and product quality. To ensure high quality of OPGW, ZTT always selects raw materials from international and domestic famous brands. ZTT also has received certifications of SA8000, ISO9001 and ISO14001.

Test Report



KINECTRICS



KEMA



CEPRI



TICW

Testing

Type Testing

All types of our OPGW/OPPC cable have passed respective type tests from internationally acknowledged independent test laboratory according to IEC 60794 and IEEE 1138. If you want any information of the type test report, please contact us.

Routine Testing

- Optical fiber attenuation coefficient (OTDR)
- Inspection of wires before stranding
- Quality of surface
- Direction of outer layer
- Diameter of cable
- Weight of cable
- Packing inspection

Factory Acceptance Testing

- Design
- Optical fiber attenuation coefficient (OTDR)
- Mode Field Diameter of optical fiber
- Cladding Diameter of optical fiber
- Cladding non-circularity of optical fiber
- Visual inspection of the cable elements
- Lay length of outer layer
- Diameter of cable
- Weight of cable
- Breaking strength of cable

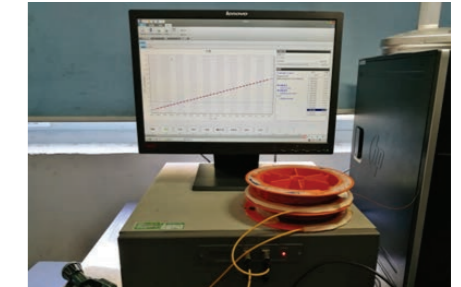
Test Facilities



Optical Fiber Analysis System



Optical Time Domain Reflectometer



Chromatic Dispersion Test



Tensile Strength Test Equipment



DC Resistance Test



Tension test instrument for wires



Impact Test Instrument



Crush Test Instrument



Temperature Cycling Test chamber

ZTT has passed the test by authoritative institutions at home and abroad. The authoritative institutions include Quality Supervision & Inspection Center of Optical Communication Products, Ministry of Information Industry of P.R.C, Shanghai Electric Cable Research Institute, State Grid Electric Power Research Institute, U.S. PLP Company Laboratory, Canada KINECTRICS Company, JEN—Polish National Power Laboratory and KEMA.

References

Overseas Reference

Country	Total Length	Maximum Voltage
India	128206 km	±800 kV
Pakistan	5738 km	660 kV
Indonesia	7368 km	500 kV
Thailand	7217 km	±660 kV
Malaysia	6396 km	275 kV
Australia	4282 km	330 kV
Saudi Arabia	12644 km	380 kV
Turkey	10181 km	420 kV
Kazakhstan	1714 km	500 kV
Uzbekistan	915 km	500 kV
Poland	8348 km	400 kV
Finland	1291 km	400 kV
America	1772 km	345 kV
Canada	2607 km	287 kV
Chile	4228 km	500 kV
Ecuador	3307 km	500 kV
Ethiopia	6387 km	500 kV
Kenya	4110 km	500 kV
South Africa	4068 km	765 kV

From 2002 till now, the total global online operation length is more than 680,000km. OPGW of ZTT has been sold to more than 130 countries and regions.

Outstanding Projects

Three Ultra Project

China 400kV
 Qinghai Golmud to Tibet Lhasa ±400kV DC networking project
 Ultra-long distance:1400km
 Ultra-low temperature:-60°C
 Ultral-low loss:≤0.18dB/km

High voltage

China ±1100 kV
 Changji to Guquan ±1100 kV DC UHV Transmission Line Project
 China 1000 kV
 Southeast Shanxi province Nanyang to Jingmen AC UHV test example project
 China ±800 kV
 Hami South to Zhengzhou ±800 kV DC UHV Transmission Line Project

Large cores

Canada 230 kV
 230kV Henvey Inlet Wind Transmission Line Project
 OPGW: 144cores G.652
 Saudi Arabia 115 kV
 Southern Area Oil Operation (SAOO) Power System Reliability Improvement Portion-115 kV OHTL (Shedgum & Uthmaniyah Area)
 OPGW: 96cores G.652
 Spain 220 kV
 ENDESA GE NNJ001-OPGW Project
 OPGW: 96cores G.652
 Peru 22.9 kV
 22.9kV Quellaveco
 OPGW: 192cores G.652

Large span

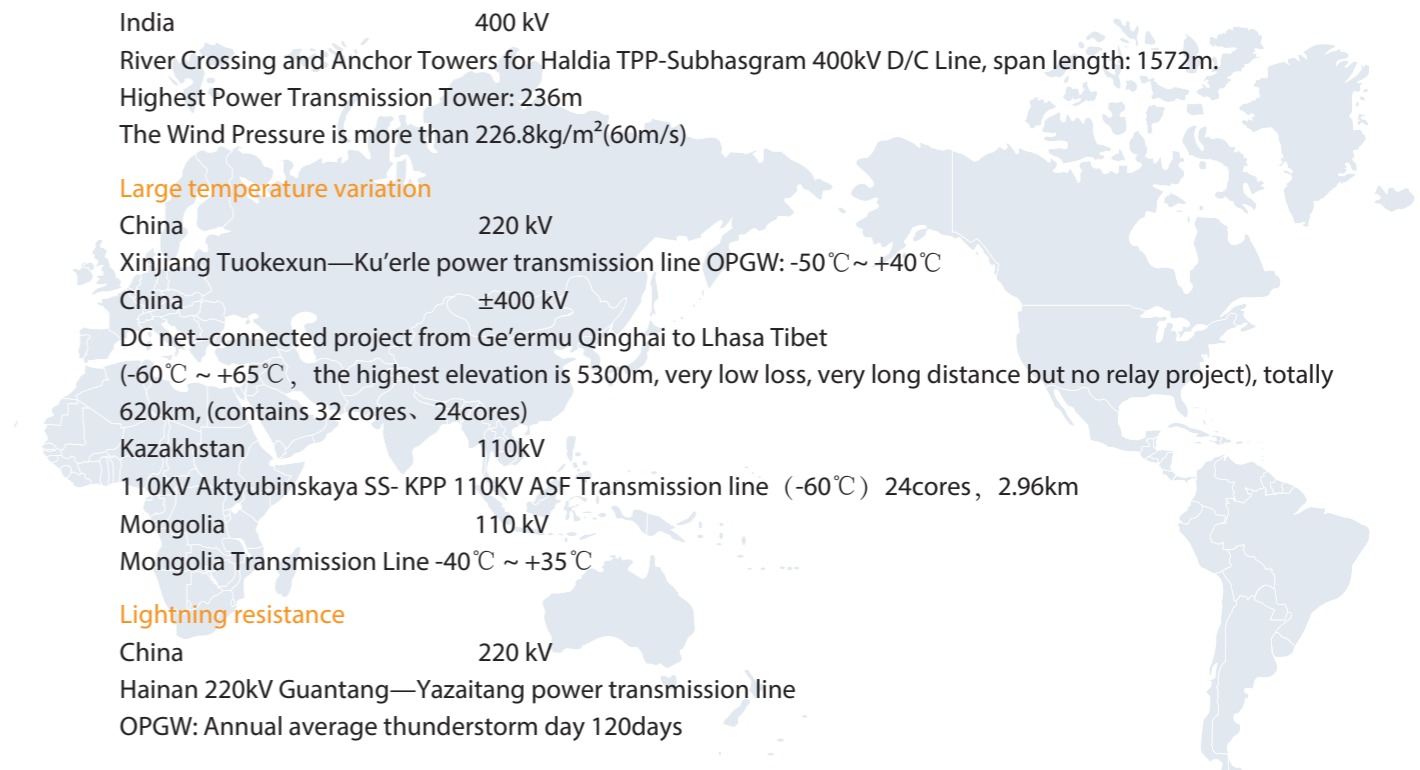
China 220 kV
 Zhoushan connect network with continent power transmission line project Luotou channel large span, span length: 2756m
 China ±800 kV
 Xiangjiaba to Shanghai DC UHV power transmission example project Xinjiyang—Yangtze River large span, span length: 2052m
 India 400 kV
 River Crossing and Anchor Towers for Haldia TPP-Subhasgram 400kV D/C Line, span length: 1572m.
 Highest Power Transmission Tower: 236m
 The Wind Pressure is more than 226.8kg/m²(60m/s)

Large temperature variation

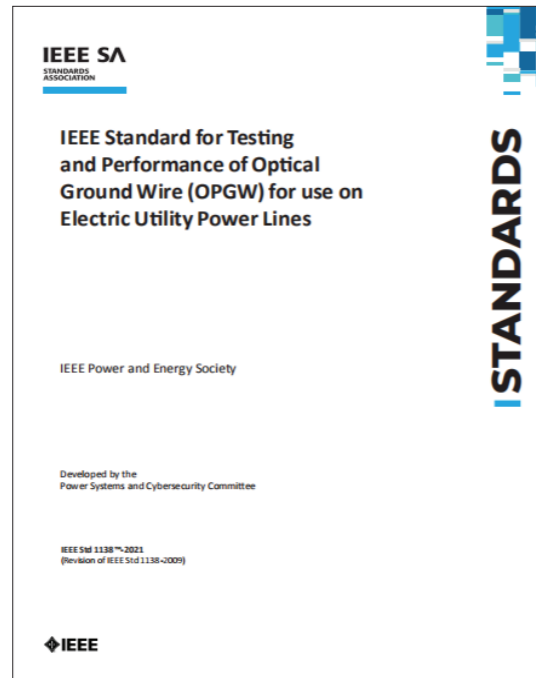
China 220 kV
 Xinjiang Tuokexun—Ku'erle power transmission line OPGW: -50°C~ +40°C
 China ±400 kV
 DC net-connected project from Ge'ermu Qinghai to Lhasa Tibet (-60°C ~ +65°C, the highest elevation is 5300m, very low loss, very long distance but no relay project), totally 620km, (contains 32 cores、24cores)
 Kazakhstan 110kV
 110KV Aktyubinskaya SS- KPP 110KV ASF Transmission line (-60°C) 24cores, 2.96km
 Mongolia 110 kV
 Mongolia Transmission Line -40°C ~ +35°C

Lightning resistance

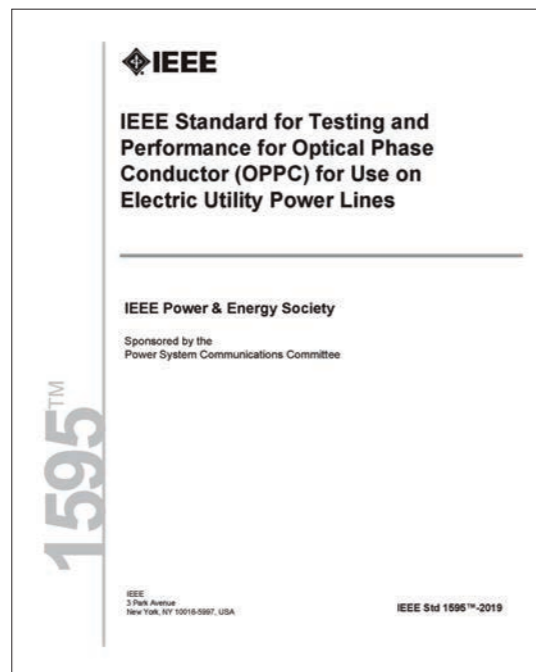
China 220 kV
 Hainan 220kV Guantang—Yazaitang power transmission line
 OPGW: Annual average thunderstorm day 120days



As one of the IEEE members, ZTT is participating in the revision of IEEE 1138 OPGW standard, and also is the drafter of IEEE 1595 OPPC standard.



Participate in the revision of IEEE1138-2021 OPGW



Drafter of IEEE 1595 OPPC standard

Installation and After-sale Service

ZTT have a rich experience on installation of OPGW and OPPC cable, and we can provide the service for our customers.



OPGW cable Laying



Joint box Installation



OPGW cable String