TGC Fiber Optical Solution

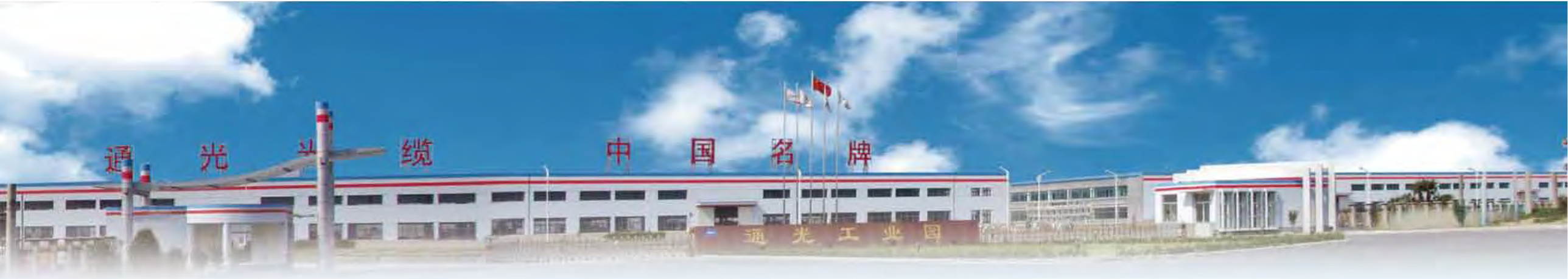
Core Values

Pursuit of excellence
continuous innovation
integrity and win-win

Connecting smartly
and efficiently

Dedicated in Wires&Cables

OPGW.DSIUS.COM



About TGC

Description	TGC is a leading manufacturer of wires and cables in Energy, Telecom, and Aviation industry
Founded	1991
Location of Headquarter and Factories	Shanghai and Haimen and Changzhou of China
Status	Public Company, TGC is a common stock traded on China Shenzhen Stock Exchange under the symbol:300265
Employees	768
Products	Power Communication:OPGW; ADSS;OPPC;OPLC Power Transmission:ACSR and 3S.ACSR;AAC;AAAC;etc Telecommunication:Radio—frequency coaxial cable; High—temperature cable

History

2001

April 16, 2001, "TG Science park" held cornerstone ceremony during "2001 Haimen gold flower festival, vice governor in nantong, jiangsu province WangRongBing, vice mayor ZhangXiaoPing and some leaders attended the ceremony, the new factory's infrastructure went into work.

2002

2002, the high-speed coloring&high speed secondary coating line imported from Austria M&S company installation, debugging successfully, TGC OPGW began in the China power market professionally. March 5, won the bidding of Baotou OPGW big engineering projects, the total order is 11 million yuan. SST production line imported from Germany's Nexans, which means TGC has a complete OPGW production line of the ability of fiber optic cable.

2003

August 20, 2003, two series TGC indoor optical cable passed American UL safety test product safety certification, it not only mark the TGC indoor cables went into the European and American market, the more the main marks TGC indoor cable improved to a new level on the quality management .

2004

March 15, 2004, TGC get military products GB / 19001-2000 quality system certification, April 20,, in Jiangsu west channel project bidding of Jiangsu power company, TGC won 500 KV all lines of fiber optic cable products, broke in 500 KV lines of import OPGW only generally. December 23,, TGC get all supply right for "China the first 750 kV ultrahigh Voltage line" exclusively.

2005

October 2005, TGC competing with international well-known manufacturers in the Nigeria KDA 132 KV transmission lines OPGW project "during the tender, with advanced technology, the guarantee of high quality and perfect after-sale service, we sole to undertake this project eventually.

2006

December 28, 2006, the chairman: Mr.Zhang Qiang and general manager of Changzhou Industrial Investment company Mr. LiuGuXiang signed the Changzhou HuaYin wire and cable Co., LTD incremental reform agreement. The signing of the agreement means that TGC officially became the biggest shareholder of Changzhou HuaYin wire and cable Co., LTD'.

2007

August 5, 2007, TGC won the OPGW project in Sudan and Nigeria again, the amount more than thousand kilometers. The users of the two countries made high praise on TGC OPGW .

2008

In 2008, China's first OPPC 35 kV cable,designed and manufactured by TGC, was began transfer operation in Shanxi, China. And the TGC OPGW used in China first 1000kV transmission project operated successfully. The TGC 3S conductor has successfully installed in the first project in China. TGC won the OPGW bidding used in the Tajikistan 500 KV power transmission project, and won two international transformation project in Guinea and Congo engineering continually.

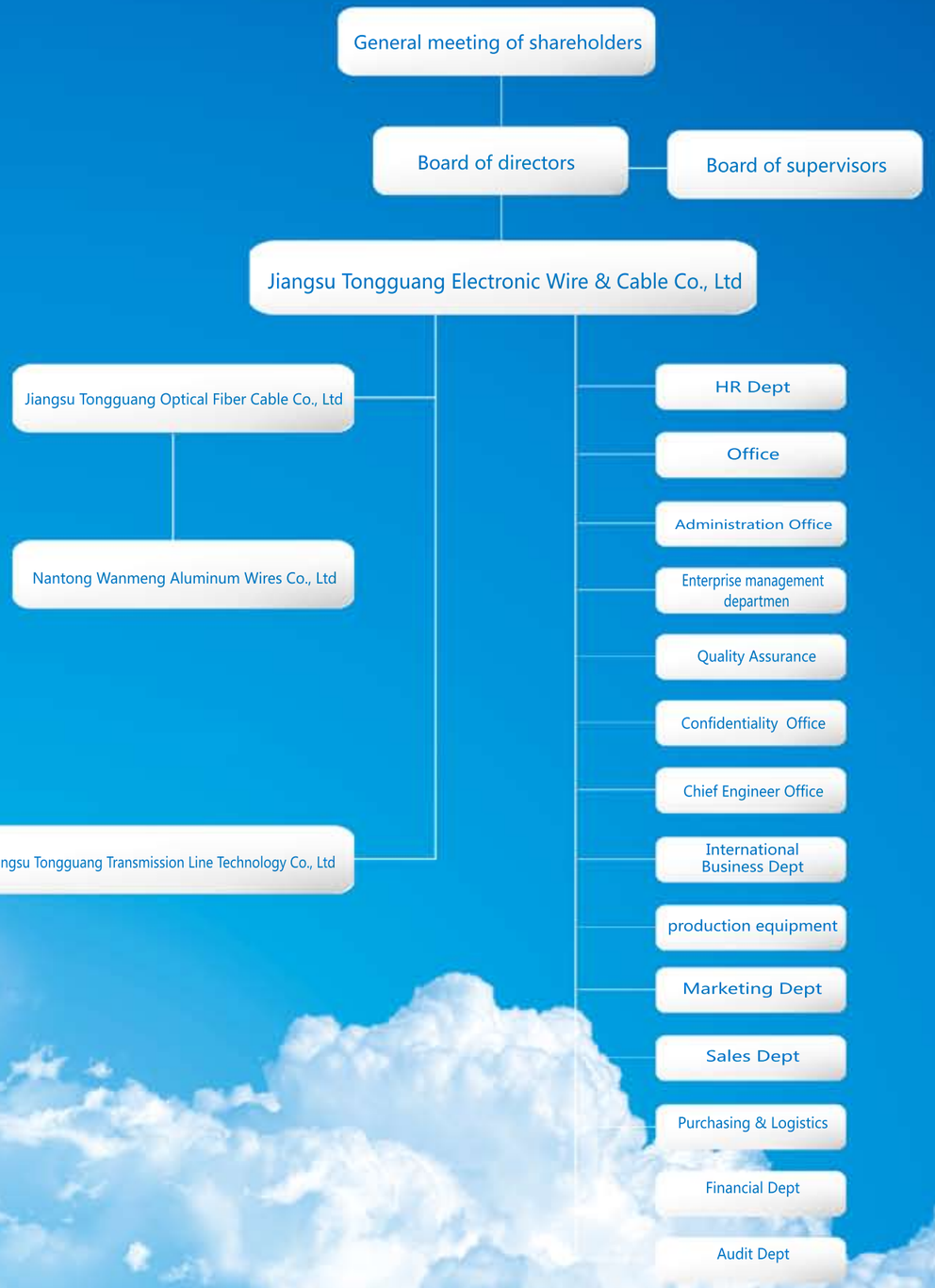
2009

In 2009 TGC won the major projects on 96 fibers subsea optical cable of Xiamen power grid construction project ; TGC won the first 96 core India OPGW supply power; TGC OPGW used in China first DC UHV project "+ 800 kV Xiangjiaba,-- Shanghai HVDC transmission project"; TGC 1000 square millimeter large cross-section wire test in Lanzhou in one time successfully; TGC OPGW exclusive won the bidding of Laos state grid; TGC supplied the first subsea cable used in deep sea area, which is the longest in China.

2010

In 2010 TGC won the bid of Henan high strength soft aluminum wire "the first soft aluminum type line wires of China power grid"; The single length more than hundred kilometers subsea cable, which designed and manufactured by TGC delivery, construction and installation successfully, made four first in China.

ORGANIZATIONAL STRUCTURE



通光线缆
TGC
Stock code: 300265

Qualification And Honor

ISO9001

ISO14001

ROSH

PRODUCT CERTIFICATE

China Optical Fiber And Cable Top 10 Most Competitive Companies

100 Top Enterprise of China Electronic Information Industry

China Most Impactive Enterprise In 30 Years History of Optical Fiber And Cable Industry

100 Top Enterprise of China Electronic Component Industry

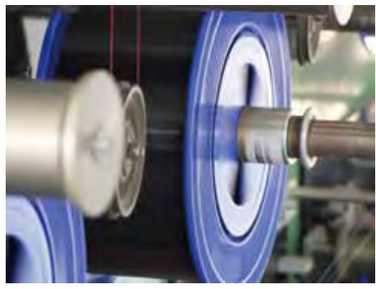
Chian Electronics Industry Well-know Brands

China Optical Fiber and Optical Cable Golden Medal Enterprise

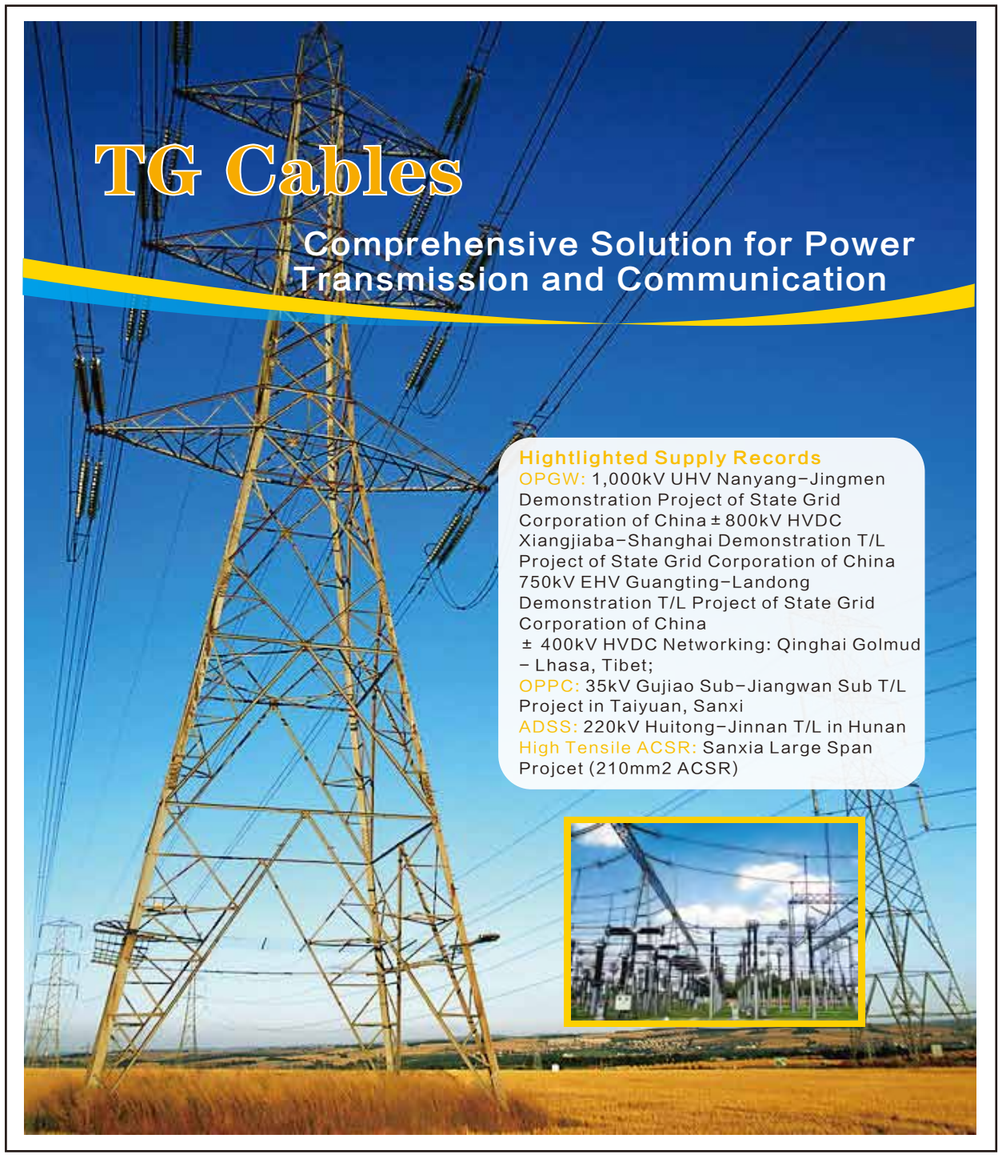
Most Valuable Electronic Enterprise Brand of China

通光线缆
TGC
Stock code: 300265

ADVANCED
FACILITIES



1 Fiber Optic Cables for Use on Electric Utility Power Lines



Aerial Optical Cables Along Electrical Power Lines

Introduction

Aerial optical cables along electrical power lines include: OPGW (optical fibre composite overhead ground wires), OPPC (optical phase conductor), MASS (metallic armoured self supporting cable), ADSS (all dielectric self supporting cable) and OPAC (optical attached cable).

In this introduction, OPGW, OPPC and ADSS, will be mainly introduced.

OPGW cables, installed on the top of power poles or towers, have the dual performance functions of standard ground wires with communication capabilities.

OPPC cables, installed at the positions of power transmission phase conductors, have the dual performance functions of standard phase conductors with communication capabilities.

ADSS cables, installed at proper positions of power poles or towers, are a kind of non-metal optical cables suspended directly between two points without need of other supporting elements.

If you are interesting in or have any request on MASS and OPAC, please contact us without any hesitations, you will get a quick response.

Standards And Specifications

Tongguang' s products are complied with relevant international standards and national and industrial standards of China, including but not limited to following standards:
GB/T: national standard of PRC;
DL/T: electrical power industrial standards of PRC;
YD/T: post and telecom industrial standard of PRC;
JB/T: mechanical industrial standard of PRC (PRC: the People' s Republic of China).

Relevant standards about optical fibres:

ITU-T G.650 Definition and test methods for the relevant parameters of single-mode fibres
ITU-T G.651 Characteristics of a 50/125 um multimode graded index optical fibre cable
ITU-T G.652 Characteristics of a single-mode optical fibre cable
ITU-T G.653 Characteristics of a dispersion-shifted single mode optical fibre cable
ITU-T G.654 Characteristics of a cut-off shifted single-mode optical fibre and cable
ITU-T G.655 Characteristics of a non-zero dispersion-shifted single-mode optical fibre and cable
ITU-T G.656 Characteristics of a fibre and cable with non-zero dispersion for wideband optical transport
GB/T 9771 Single mode fiber series for communication
GB/T 12357 Multi mode fiber series for communication
GB/T 15972.1 General specification of optical fibers, Part 1: General specification（eq. IEC793-1-1：1995）
GB/T 15972. 2 General specification of optical fibers, Part 2: Test methods of size parameter (eq. IEC793-1-2：1998）
GB/T 15972.3 General specification of optical fibers, Part 3: Test methods of mechanical properties（eq. IEC793-1-3：1995）
GB/T 15972.4 General specification of optical fibers, Part 4: Test methods of transmission and optical characteristics（eq. IEC 793-1-4：1995）
GB/T 15972.5 General specification of optical fibers, Part 5: Test methods of environment characteristics（eq. IEC793-1-5：1995）

Relevant standards about optical cables:

IEC 60794-4 Optical fibre cables -Part 4: Sectional Specification--Aerial optical cables along electrical power lines
IEC 60794-4-1 Optical fibre cables - Part 4-1: Aerial optical cables for high- voltage power lines
IEEEStd P1222 IEEE standard for all-dielectric self-supporting fiber optic cable
IEEE 1138 IEEE standard construction of composite fiber optic overhead ground wire (OPGW) for use on electric utility power lines
GB/T 18899 All dielectric self supporting optical fiber cables
GB/T 7424.4 Optical cables, Part 4：Sectional specification-Optical fiber composite overhead ground wires
DL/T 788 All dielectric self supporting optical fiber cables
DL/T 832 Optical fiber composite overhead ground wires
DL/T 767 Technical specification and test methods for ADSS preforming fittings
DL/T 766 Technical specification and test methods for OPGW preforming fittings

Relevant standards about raw materials:

IEC 60888 Zinc-coated steel wires for stranded conductors
IEC 61232 Aluminium-clad steel wires for electrical purposes
IEC 60104 Aluminium-magnesium-silicon alloy wire for over-head line conductors
IEC 60889 Hard-drawn aluminium wire for overhead line conductors
IEC 61394 Overhead lines - characteristics of greases for aluminium, aluminium alloy and steel bare conductors
DIN 48200 T8 Specification for materials of aluminum clad steel wires
DIN 48200 T6 Specification for materials of aluminum alloy wires.
ASTM B416 Standard specification for concentric-lay-stranded aluminum-clad steel conductors
GB/T 17937 Aluminum-clad steel wires for electrical purposes（idt. IEC 61232，1993）
GB/T 17048 Hard-drawn aluminum wire for overhead line conductors (eqv. IEC 60889，1993）
GB/T 4239 Stainless steel and heat resist cold-rolled steel strip
JB/T 8134 Aluminum-magnesium-silicon alloy wire for over-head line conductors (ist IEC 60104）
YD/T 839.3 Filling and flooding compound for communication cables and optical cables.

General Design Requirements

No.	Design performances	OPGW	OPPC	ADSS
1	Fiber count and type	●	●	●
2	Detail description of optical cables designing	●	●	●
3	Overall diameter（mm）	●	●	●
4	Calculating cross section area for RTS（mm2）	●	●	●
5	Calculated mass（kg/km）	●	●	●
6	RTS—(kN）	●	●	●
7	MAT—Max allowable tensile strength (kN)	●	●	●
8	Average tension in a year(N/mm2)[or average stress in a year (N/mm2)]	●	●	●
9	Yang's modulus(Elastic modulus)(N/mm2)	●	●	●
10	Linear expansion coefficient(1/℃)	●	●	●
11	DC resistance（Ω/km）	●	●	—
12	Short current capacity I^2t/（$kA^2 \cdot s$）	●(1)	—	—
13	Safe continual current-carrying capacity（A）	—	●	—
14	Storage and operating temperature range (℃)	●	●	●
15	Strain margin (%)	●	●	●
16	Outer layer stranding direction	●	●	—
17	Tracking resistant sheath（if applicable）	—	—	●
（1） Operation temperature range of optical cable under short-circuit current will be decided by supplier.				

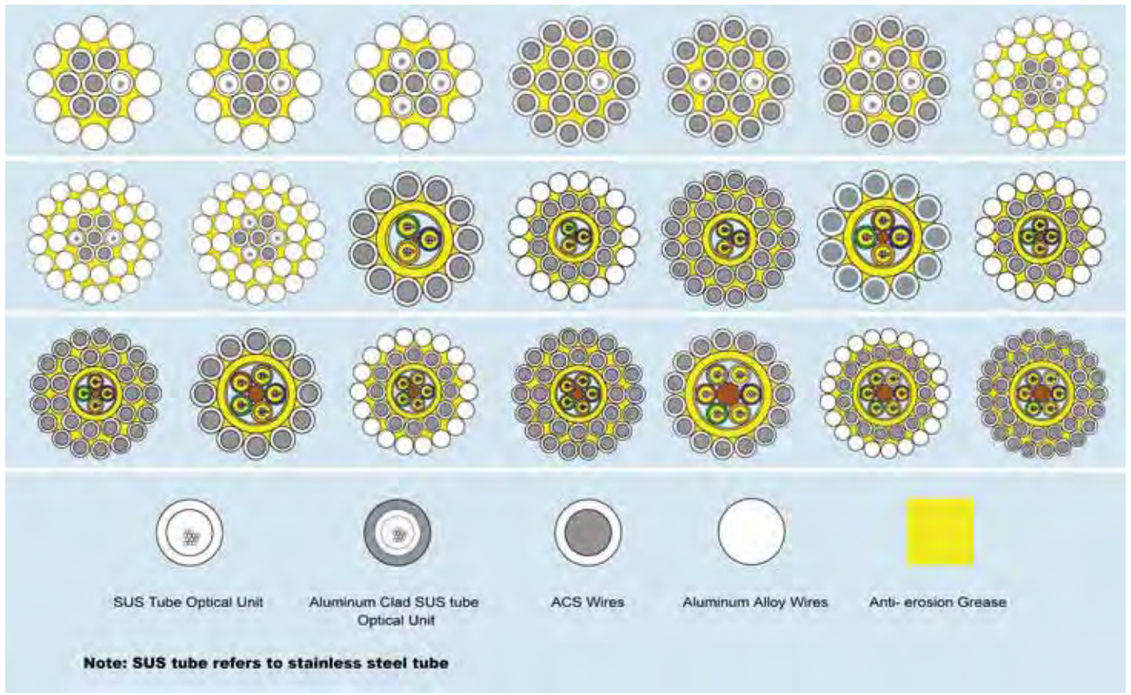
OPGW/OPPC Structure Design

Description

According to position of optical fiber unit, it could be classified into central tube type and eccentric tube type.
-- Optical unit is classified into stainless steel tube with optical fibers, and aluminum clad stainless steel tube.
-- According to customer' s requirements or requirements of optical transmission system, determine fiber type and count in the optical tube
-- According to customer' s detail requirements to optical fiber type and count, determine quantity of optical unit, it could be 1, 2 or 3 (maximum at present).
-- According to customer' s detail requirements to cable mechanical , electrical performance and span, tensile strength, sag and weather condition, the stranded layer could be one layer or multi layers, stranded wires could be ACS (aluminium clad steel) wires or composition of ACS wires with aluminium or aluminium alloy wires.
-- In order to ensure the operation life, the interstice of stranded wires should be covered with anti-erosion grease(IEC 60394).

Structure Drawing of Central Optical Fiber Unit Type

Structure Drawing of Eccentric (Stranded) Optical Fiber Unit Type

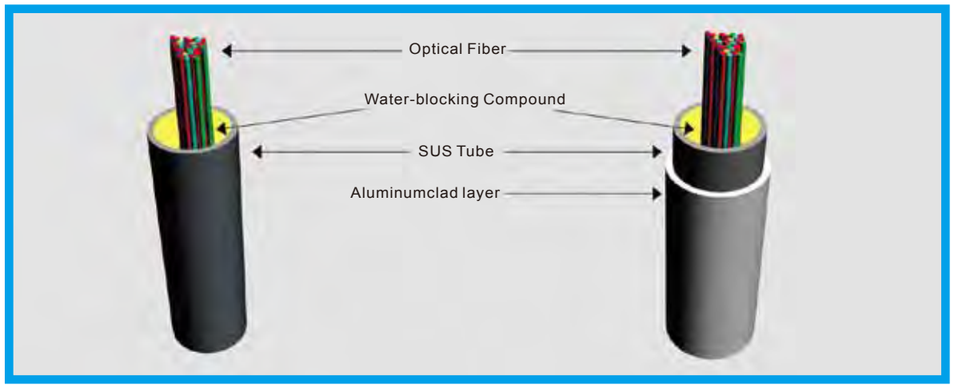


Optical Fiber Unit

Optical Fiber Unit

Types of optical fiber unit of OPGW/OPPC could be classified into two types, they are SUS tube type and aluminum clad SUS tube type. The SUS tube is manufactured by laser welding-drawing technique, and optical fibers and water-blocking compound are introduced into tube at the same time of welding-drawing in process, forming optical unit.
-- The CO2 gas laser of line is driven by RF, and the output beam has single mode pattern with good energy concentration, makes the best weld seam quality.
-- The welding-drawing process plays a roll of defects screen, passing through an on-line eddy-current detection, defects such as dummy welding, leaky welding etc could be completely gotten rid of.
-- Adopt Tongguang' s unique technique, excess length of optical fibers in tube could be controlled precisely, uniformity of excess length is better than ±0.2‰
-- With unique excellent water block performance. For 1m of optical unit, under 3m of water height, after 1 hr., no water will be penetrated at another end of optical unit.
-- Maximum fiber count of a tube is depended on size of SUS tube and structure of OPGW, it could be optimized by careful design
-- According to customer' s requirement, proper thickness of aluminum could be covered to SUS tube optical fiber unit, forming aluminum clad stainless steel tube optical unit.

Structure Drawing of Optical Fiber Unit



Optical Fiber Unit Specification

Size of SUS tube (mm)	Central optical fiber unit type		Stranded optical fiber unit type	
	Max. fiber count	Max. excess length	Max. fiber count	Max. excess length
2.5	12	5.0‰	24	2.6‰
2.7	20	5.0‰	30	2.7‰
3.0	30	5.0‰	36	3.3‰
3.2	36	5.0‰	48	3.0‰
3.3	40	5.0‰	48	3.9‰
3.4	40	6.0‰	48	4.0‰
3.6	48	6.0‰	48	4.7‰
3.8	48	6.5‰	48	5.2‰

Typical Structure and Parameter of OPGW

Some structures and characteristics of typical representative OPGW are shown in the below list, however, they do not represent the whole products of the company. If you have any requests, please contact local representative office or directly contact the company.

Central Optical Fiber SUS Tube Structure (Parts)

Structure Drawing	Structure：central optical fiber SUS tube structure with single stranded layer		
	Optical Cables Type Model	OPGW-1C1/36 (M48/R60-13)	OPGW-1C1/48 (M68/R85-25)
	Max. fiber count	36	48
	Tube size	ϕ3.2 mm	ϕ3.8mm
	Cable diameter	ϕ9.6 mm	Φ11.4 mm
	Cross-section carry area	48.25 mm^2	68.05 mm^2
	Cable weight	342 kg/km	475kg/km
	Rated Tensile Strength（RTS）	60 kN	85 kN
	DC resistance at 20℃	1.782 Ω/km	1.264 Ω/km
	Short current capacity (40~200℃)	12 $kA^2 \cdot s$	25 $kA^2 \cdot s$
	Linear expansion coefficient	13.0×10^{-6}/℃	13.0×10^{-6}/℃
	Young's modulus	162.0 kN/mm^2	162.0 kN/mm^2

Structure Drawing	Structure：central optical fiber SUS tube structure with double stranded layers		
	Optical Cables Type Model	OPGW-2C1/30(M127/R160-80)	OPGW-2C1/40(M163/R205-132)
	Max. fiber count	30	40
	Tube size	ϕ3.00 mm	ϕ3.40 mm
	Cable diameter	ϕ15.00 mm	ϕ17.00 mm
	Cross-section carry area	127.23 mm^2	163.43 mm^2
	Cable weight	874 kg/km	1116 kg/km
	Rated Tensile Strength（RTS）	159 kN	205 kN
	DC resistance at 20℃	0.678 Ω/km	0.528 Ω/km
	Short current capacity (40~200℃)	80 $kA^2 \cdot s$	132 $kA^2 \cdot s$
	Linear expansion coefficient	13.0×10^{-6}/℃	13.0×10^{-6}/℃
	Young's modulus	162.0 kN/mm^2	162.0 kN/mm^2

Typical Structure and Parameter of OPGW(L)

Some structures and characteristics of typical representative OPGW are shown in the below list, however, they do not represent the whole products of the company. If you have any requests, please contact local representative office or directly contact the company.

Central Optical Fiber Aluminum Clad SUS Tube Structure (Parts)

Structure Drawing	Structure：central optical fiber aluminum clad SUS tube structure with single stranded layer		
	Optical Cables Type Model	OPGW(AL-Tube)-1S36(M75/R68-33)	OPGW(AL-Tube)-1S 36(M88/R83-43)
	Max. fiber count	36	36
	Tube size	ϕ6.20 mm	ϕ6.20 mm
	Cable diameter	ϕ11.40 mm	ϕ12.30 mm
	Cross-section carry area	75.24 mm^2	87.90 mm^2
	Cable weight	430 kg/km	513 kg/km
	Rated Tensile Strength（RTS）	67 kN	83 kN
	DC resistance at 20℃	0.714 Ω/km	0.646 Ω/km
	Short current capacity (40~200℃)	32 $kA^2 \cdot s$	43 $kA^2 \cdot s$
	Linear expansion coefficient	14.3×10^{-6}/℃	14.0×10^{-6}/℃
	Young's modulus	130.8 kN/mm^2	135.3 kN/mm^2

Structure Drawing	Structure：central optical fiber aluminum clad SUS tube structure with double stranded layers		
	Optical Cables Type Model	OPGW(AL-Tube)-2S36(M160/R170-130)	OPGW(AL-Tube)-2S36(M171/R183-147)
	Max. fiber count	36	36
	Tube size	ϕ6.20 mm	ϕ6.20 mm
	Cable diameter	ϕ16.60 mm	ϕ17.00 mm
	Cross-section carry area	160.19 mm^2	171.01 mm^2
	Cable weight	990 kg/km	1061 kg/km
	Rated Tensile Strength（RTS）	170 kN	183 kN
	DC resistance at 20℃	0.420 Ω/km	0.399 Ω/km
	Short current capacity (40~200℃)	129 $kA^2 \cdot s$	146 $kA^2 \cdot s$
	Linear expansion coefficient	13.5×10^{-6}/℃	13.5×10^{-6}/℃
	Young's modulus	147.3 kN/mm^2	148.3 kN/mm^2

Typical Structure and Parameter of OPGW

Some structures and characteristics of typical representative OPGW are shown in the below list, however, they do not represent the whole products of the company. If you have any requests, please contact local representative office or directly contact the company.

Stranded Optical Fiber SUS Tube Structure (Parts)

Structure Drawing	Structure：stranded optical fiber SUS tube structure with double stranded layers		
	Optical Cables Type Model	OPGW-2S1/24(M89/R111-39)	OPGW-2S1/48(M150/R189-111)
	Max. fiber count	24	48
	Tube size	ϕ2.50 mm	ϕ3.40 mm
	Cable diameter	ϕ12.60 mm	ϕ16.40 mm
	Cross-section carry area	88.76 mm^2	150.11 mm^2
	Cable weight	615 kg/km	1026 kg/km
	Rated Tensile Strength（RTS）	111 kN	188 kN
	DC resistance at 20℃	0.972 Ω/km	0.575 Ω/km
	Short current capacity (40~200℃)	39 $kA^2 \cdot s$	111 $kA^2 \cdot s$
	Linear expansion coefficient	13.0×10^{-6}/℃	13.0×10^{-6}/℃
	Young's modulus	162.0 kN/mm^2	162.0 kN/mm^2

Structure Drawing	Structure：stranded optical fiber SUS tube structure with double stranded layers		
	Optical Cables Type Model	OPGW-2S1/24(M107/R133-57)	OPGW-2S1/48(M150/R92-190)
	Max. fiber count	24	48
	Tube size	ϕ2.50 mm	ϕ3.20 mm
	Cable diameter	ϕ12.60 mm	ϕ16.40 mm
	Cross-section carry area	88.76 mm^2	150.11 mm^2
	Cable weight	381 kg/km	631 kg/km
	Rated Tensile Strength（RTS）	54 kN	92 kN
	DC resistance at 20℃	0.471 Ω/km	0.279 Ω/km
	Short current capacity (40~200℃)	66 $kA^2 \cdot s$	190 $kA^2 \cdot s$
	Linear expansion coefficient	17.4×10^{-6}/℃	17.4×10^{-6}/℃
	Young's modulus	97.6 kN/mm^2	97.7 kN/mm^2

Typical Structure and Parameter of OPGW

Some structures and characteristics of typical representative OPGW are shown in the below list, however, they do not represent the whole products of the company. If you have any requests, please contact local representative office or directly contact the company.

Stranded Optical Fiber SUS Tube Structure (Parts)

Structure Drawing	Structure：stranded optical fiber SUS tube structure with three stranded layers	
	Optical Cables Type Model	OPGW-3S1/36(M281/R128-714)
	Max. fiber count	36
	Tube size	ϕ3.00 mm
	Cable diameter	ϕ22.10 mm
	Cross-section carry area	280.80 mm^2
	Cable weight	980 kg/km
	Rated Tensile Strength（RTS）	128 kN
	DC resistance at 20℃	0.132 Ω/km
	Short current capacity (40~200℃)	714 $kA^2 \cdot s$
	Linear expansion coefficient	19.7×10^{-6}/℃
	Young's modulus	81.2 kN/mm

Structure Drawing	Structure：stranded optical fiber SUS tube structure with three stranded layers	
	Optical Cables Type Model	OPGW-3S1/24(M214/R269-227)
	Max. fiber count	24
	Tube size	ϕ2.70 mm
	Cable diameter	ϕ19.35 mm
	Cross-section carry area	214.26 mm^2
	Cable weight	1462 kg/km
	Rated Tensile Strength（RTS）	269 kN
	DC resistance at 20℃	0.404 Ω/km
	Short current capacity (40~200℃)	227 $kA^2 \cdot s$
	Linear expansion coefficient	13.0×10^{-6}/℃
	Young's modulus	162.0 kN/mm^2

Typical Structure and Parameter of OPGW

Some structures and characteristics of typical representative OPGW are shown in the below list, however, they do not represent the whole products of the company. If you have any requests, please contact local representative office or directly contact the company.

Stranded loose tube aluminum optical unit structure (part)

Structure Drawing	Structure：double layer stranded loose tube aluminum optical unit structure		
	Optical Cables Type Model	OPGW(L-AL_Tube) – 2S 48(M107/R95-85)	OPGW(L-AL_Tube) – 2S 48(M125/R117-111)
	Max. fiber count	48	48
	Tube size	ϕ10.0 mm	ϕ10.0 mm
	Cable diameter	ϕ15.10 mm	ϕ16.1 mm
	Cross-section carry area	107.18 mm^2	125.44 mm^2
	Cable weight	605 kg/km	726 kg/km
	Rated Tensile Strength（RTS）	94.5 kN	116.5 kN
	DC resistance at 20℃	0.489Ω/km	0.443Ω/km
	Short current capacity (40~200℃)	84 $kA^2 \cdot s$	111 $kA^2 \cdot s$
	Linear expansion coefficient	14.4×10^{-6}/℃	14.1×10^{-6}/℃
	Young's modulus	128.8 kN/mm^2	133.6 kN/mm^2

Structure Drawing	Structure：double layer stranded loose tube aluminum optical unit structure		
	Optical Cables Type Model	OPGW(L-AL_Tube) – 2S 48(M210/R219-277)	OPGW(L-AL_Tube) – 2S 48(M260/R278-407)
	Max. fiber count	48	48
	Tube size	ϕ10.0 mm	ϕ10.0 mm
	Cable diameter	ϕ20.10 mm	ϕ22.1 mm
	Cross-section carry area	210.27 mm^2	259.75 mm^2
	Cable weight	1285 kg/km	1611 kg/km
	Rated Tensile Strength（RTS）	218.8 kN	278.5 kN
	DC resistance at 20℃	0.309Ω/km	0.263Ω/km
	Short current capacity (40~200℃)	277 $kA^2 \cdot s$	406 $kA^2 \cdot s$
	Linear expansion coefficient	13.6×10^{-6}/℃	13.5×10^{-6}/℃
	Young's modulus	145.0 kN/mm^2	148.3 kN/mm^2

Typical Structure and Parameter of OPPC

Some structures and characteristics of typical representative OPGW are shown in the below list, however, they do not represent the whole products of the company. If you have any requests, please contact local representative office or directly contact the company.

Stranded Optical Fiber SUS Tube Structure (Parts)

Structure Drawing	Structure：stranded optical fiber SUS tube structure with double stranded layers		
	Optical Cables Type Model	OPPC-2S 1/24(M88/R47-257)	OPPC-2S 1/48(M155/R82-362)
	Max. fiber count	24	48
	Tube size	ϕ2.50 mm	ϕ3.20 mm
	Cable diameter	ϕ12.60 mm	ϕ16.70 mm
	Cross-section carry area	29.85	52.39
	Section area of electrical Aluminum	58.90	102.64
	Total cross section area	88.76 mm^2	155.02 mm^2
	Cable weight	381 kg/km	652 kg/km
	Rated Tensile Strength（RTS）	47 kN	82 kN
	DC resistance at 20℃	0.418Ω/km	0.240Ω/km
	Safe current-carrying capacity	257 A	362 A
	Linear expansion coefficient	17.1×10^{-6}/℃	17.0×10^{-6}/℃
	Young's modulus	91.7 kN/mm^2	91.8 kN/mm^2
	Corresponding wires model	LGJ-50/30	LGJ-95/55

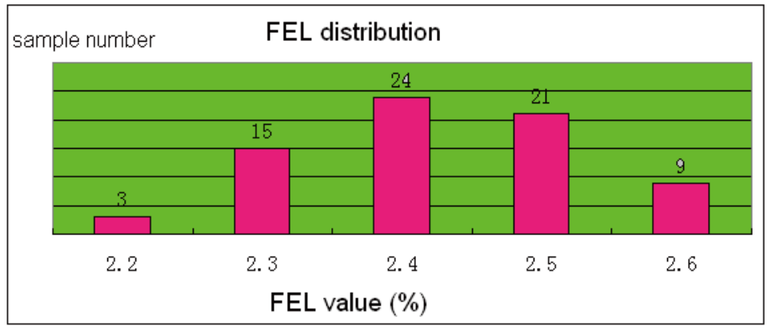
Structure Drawing	Structure：stranded optical fiber SUS tube structure with three stranded layers		
	Optical Cables Type Model	OPPC-3S 1/30(M238/R83-502)	OPPC-3S 1/30(M287/R87-363)
	Max. fiber count	30	30
	Tube size	ϕ2.80 mm	ϕ2.70 mm
	Cable diameter	ϕ20.40 mm	ϕ22.45 mm
	Cross-section carry area	40.09	37.17
	Section area of electrical Aluminum	198.16	250.15
	Total cross section area	238.25 mm^2	287.32 mm^2
	Cable weight	835 kg/km	960 kg/km
	Rated Tensile Strength（RTS）	83 kN	87 kN
	DC resistance at 20℃	0.137 Ω/km	0.110 Ω/km
	Safe current-carrying capacity	502 A	572 A
	Linear expansion coefficient	19.3×10^{-6}/℃	20.0×10^{-6}/℃
	Young's modulus	73.8 kN/mm^2	69.7 kN/mm^2
	Corresponding wires model	LGJ-185/35	LGJ-240/40

Typical Test

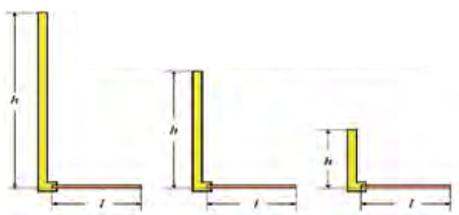
Typical FEL and FEL uniformity of optical tube unit with 24 fibers

Design requirement of fiber excess length: 2.4‰												
Fiber No.	1	2	3	4	5	6	7	8	9	10	11	12
FEL(‰)	2.4	2.5	2.3	2.4	2.4	2.4	2.5	2.5	2.6	2.3	2.4	2.5
Deviation(‰)	0	+0.1	-0.1	0	0	0	+0.1	+0.1	+0.2	-0.1	0	+0.1
Fiber No.	13	14	15	16	17	18	19	20	21	22	23	24
FEL(‰)	2.6	2.6	2.5	2.4	2.3	2.3	2.2	2.3	2.5	2.4	2.4	2.5
Deviation(‰)	+0.2	+0.2	+0.1	0	-0.1	-0.1	-0.2	-0.1	+0.1	0	0	+0.1

Note: FEL refers to fiber excess length



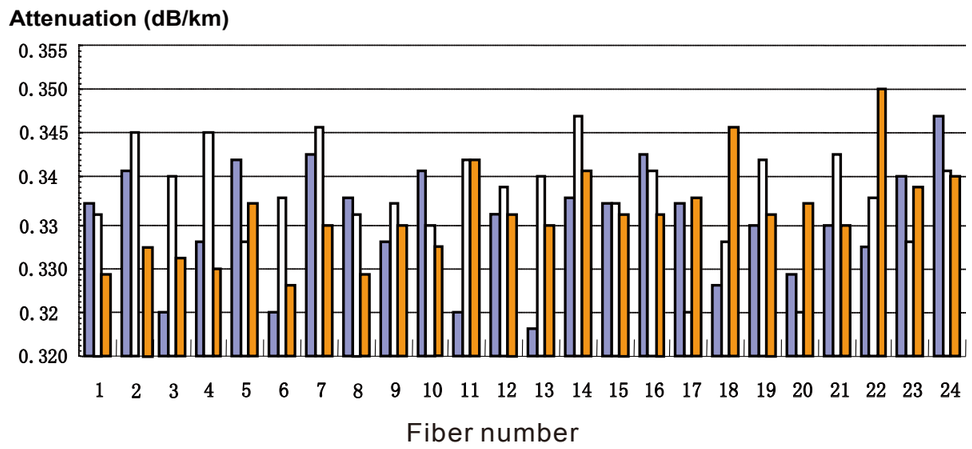
Water Penetration Performance of Optical Fiber Unit



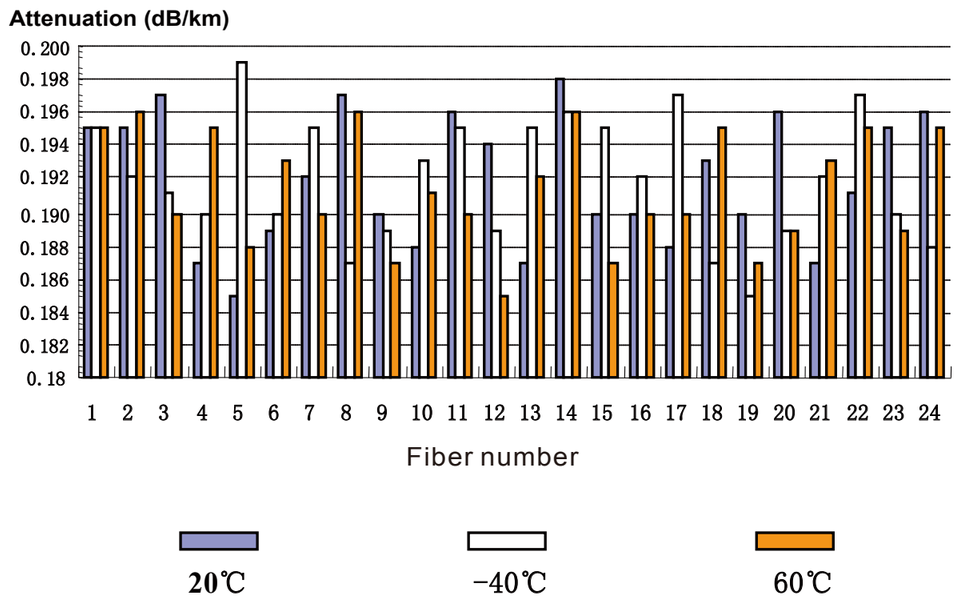
h: height of water column	l: length of optical unit	Test time	Test result
3.0m	1.0m	1 hr	NO water penetration
2.0m	1.0m	24 hr	NO water penetration
1.0m	1.0m	48 hr	NO water penetration

Typical Test

Attenuation–Temperature Variation of Optical Fiber at 1310nm



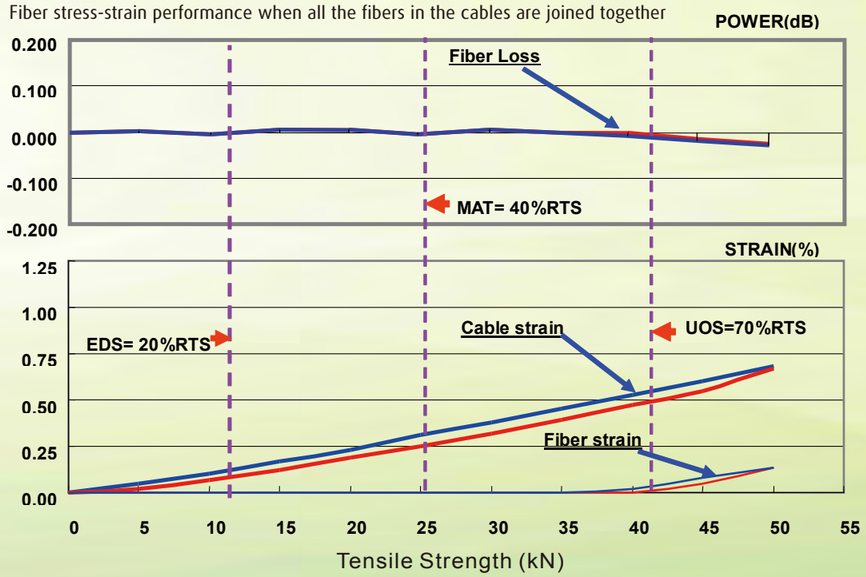
Attenuation–Temperature Variation of Optical Fiber at 1550nm



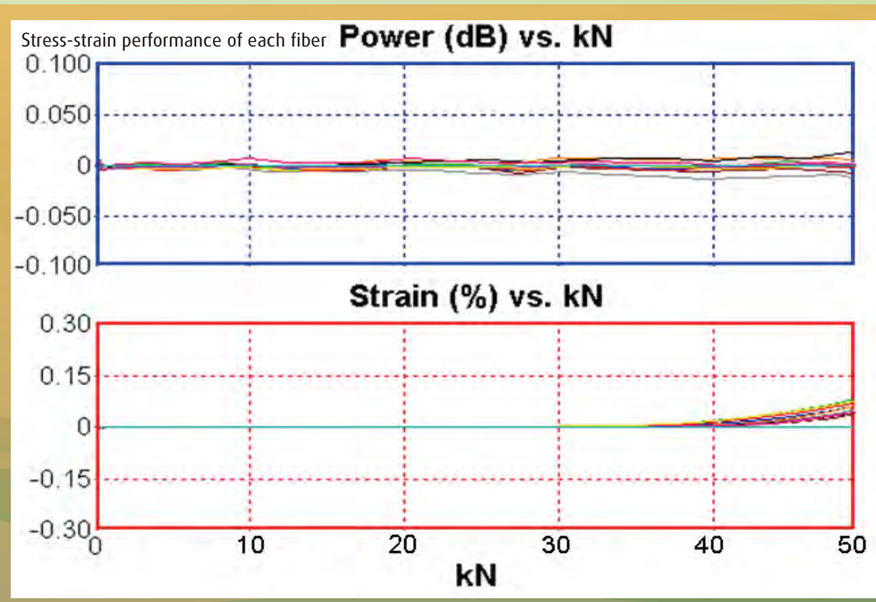
Typical Test

Tensile Strength test of OPGW – Cable Strain, Fiber Strain, Attenuation Variation

Fiber stress-strain performance when all the fibers in the cables are joined together



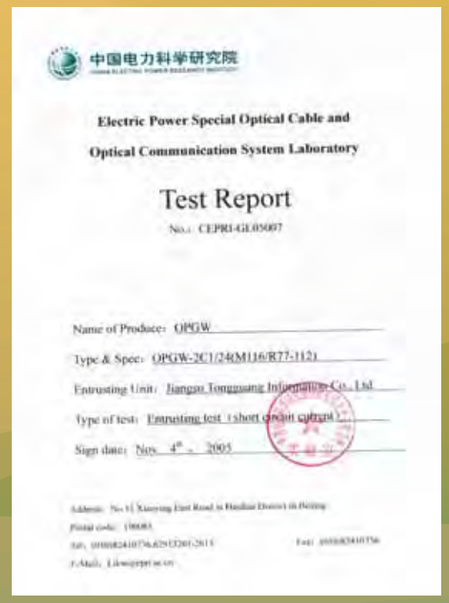
Stress-strain performance of each fiber



Test Report

Tensile Strength (kN)

Lightening Arc Test



中国电力科学研究院

Electric Power Special Optical Cable and Optical Communication System Laboratory

Test Report

No.: CEPRI-GL05007

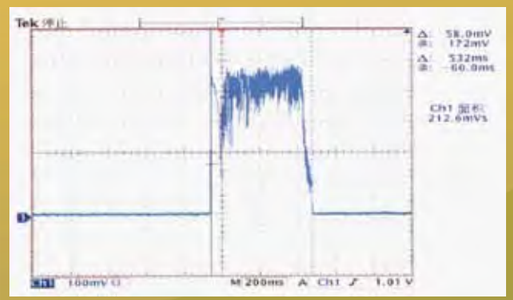
Name of Produce: OPGW

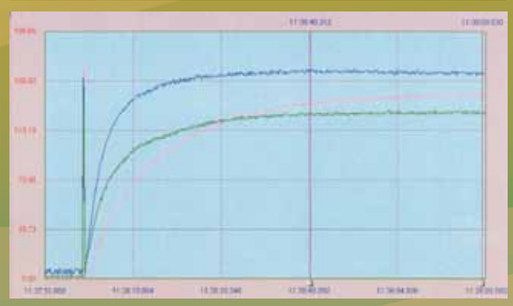
Type & Spec: OPGW-2C1/24M116/R77-112)

Entrusting Unit: Jiangsu Tongguang Information Co., Ltd

Type of test: Entrusting test (short circuit current)

Sign date: Nov. 4th, 2005





Test Result

Test Items	Test Standard				
	IEEE II38	IEC 60794-4	EN 60794-4	GB/T 7424.4	DL/T 832
Fiber in cable	√	/	/	√	√
Structure examination	/	/	/	√	√
Tensile strength test	√	√	√	√	√
Strain margin	√	√	√	√	√
Aeolian vibration test	√	√	√	√	√
Galloping test	√	/	/	√	√
Sheave test	√	√	√	√	√
Stress-strain test	√	√	√	√	√
Creep test	√	√	√	√	√
Lightning test	/	√	√	√	√
Short circuit test	√	√	√	√	√
Water penetration test	√	√	√	√	√
Bleeding test	√	√	√	√	√
Temperature cycling test	√	√	√	√	√
Impact test	√	/	/	/	/
Crush test	√	/	/	/	/

Network Access License

Ordering Information

Type model explaining:

OPGW/OPPC — X X X / XX （MXX /R XX — XX）

- XX — Short-current capacity/ Safe current- carrying capacity
- R (RTS) Rated Tensile
- MXX — M cable cross-section carrying area
- XX — Fiber count of cable
- X — Optical unit count of cable
- X — C：central optical unit；S：Stranded optical unit
- X — Number of stranded layer
- OPGW/OPPC — Product name, an (L) is added in case of aluminum cladding tube type.

We could provide user structure design and type selection, if information is provided as below:

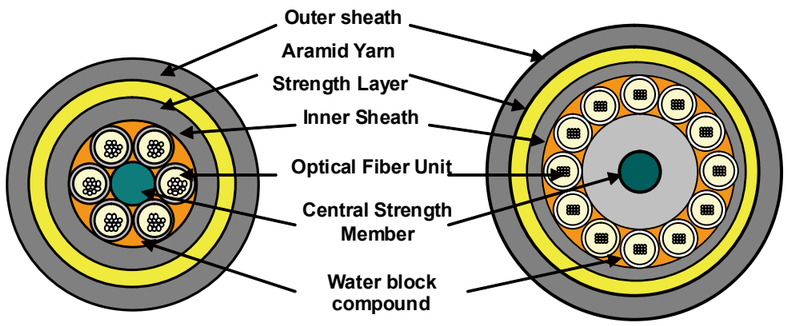
Weather condition			
	Temperature （℃）	Wind speed（m/s）	Ice thickness（mm）
Lowest temperature			
Average temperature in year			
Maximum wind speed			
Ice thickness			
Highest temperature			
Installation			

Mechanic and electric performance requirements for OPGW/OPPC					
Diameter*	mm		Normal tensile strength（RTS）*		kN
Weight*	kg/km		Max allowable tensile strength （MAT）		%RTS
DC resistance（at 20℃）	Ω/km		Every day tensile strength（EDS）		%RTS
Short circuit current capacity*	I^2t		Short circuit current value		kA
Short circuit duration*	s	Starting temperature of short circuit *	℃	End temperature in short circuit *	

Main transmission performance requirements for OPGW/OPPC			
Fiber count*		Fiber type*	
Attenuation*	dB/km(@1310nm)；		dB/km(@1550nm)
Chromatic dispersion	ps/nm.km(@1310nm)；		ps/nm.km(@1550nm)

Note 1：In some case, detail information of poles and towers and cross section drawing of line is needed.
Note 2："*" represents information must be provided.

ADSS Cable Structure Design



2～72 fiber design

72～144 fiber design

Description

Tongguang' s ADSS design is a kind of typical stranded loose tube design, which including two typical structures with maximum (but not limited to) fiber count of 72 and 144. Tongguang could make special design according to customer' s requirement.

-- Central strength member, normally adopt FRP（YD/T 1181.1）, also plays the role of anti bend break member. For maximum 144 fiber design, proper materials could be covered on outside of the FRP.

-Adopting loose tube design as fiber unit, normally, PBT（GB/T118.12001） is used as tube materials. Optical fibers with proper excess length and filling compound with excellent water-block performance are put or filled into the tubes.
-- Black PE（GB/T 15065）is placed outside of stranded optical units, forms cable core, water-block compound （YD/T 839.9）is placed in the interstice of the cable core.

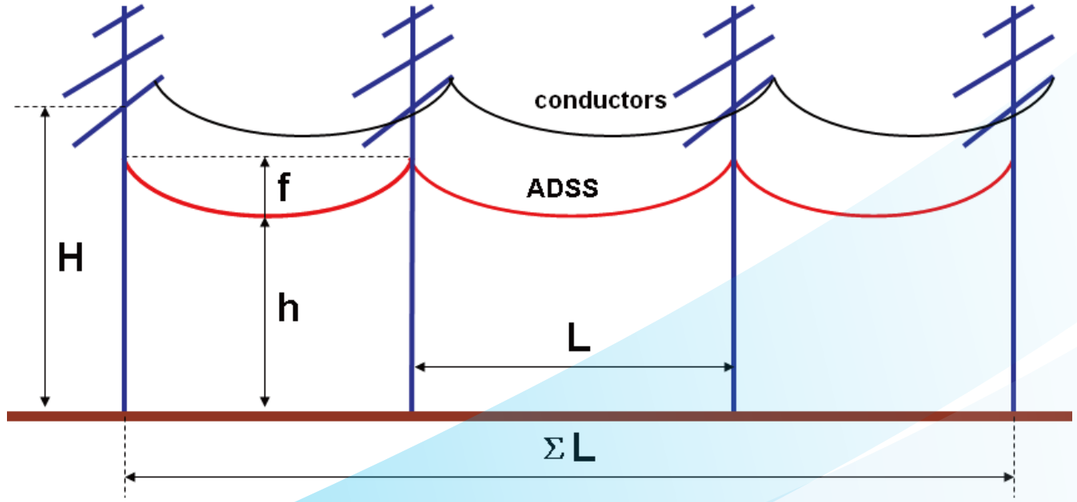
-- Maximum operation tensile strength could be calculated according to customer' s requirement to cable strength or according to weather condition and span-sag requirement, thus the quantity of aramid yarn should be used could be determined. The yarn is applied with balanced- torque, could also play the role of bullet-proof.

-- According to international and national standards, the outer sheath of ADSS could be classified into class-A and class-B, which is suited for spatial potential environments of below and above 12kV respectively.

ADSS Cable Application Design

Description

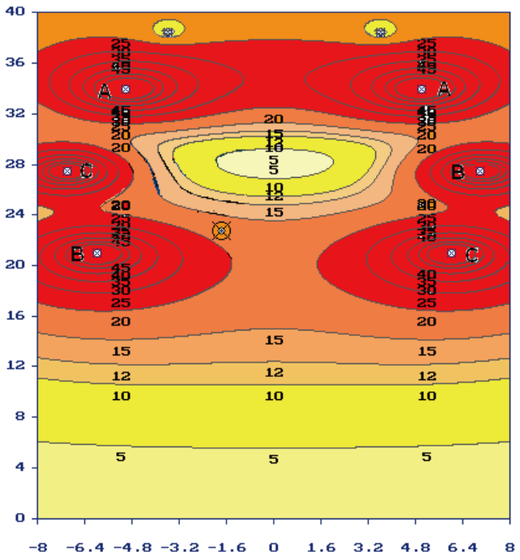
In most instances, ADSS cables are installed at existing power lines. The only way for ADSS installation is to suit existing poles/tower condition to find limited available space for installation.
Besides optical transmission performance design, two aspects of ADSS application design are:
-- Span-tension-sag design of ADSS
-- Installation position consideration of ADSS

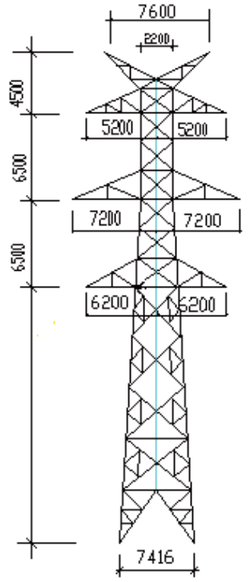


H: The name height of pole or tower, namely the distance between lowest horizontal structure to the foundation of the pole or tower.;
h: Required minimum distance of ADSS cable to ground;
f: Maximum vertical sag of ADSS cable;
L: Span;
∑L: Total length between two tension fittings

ADSS Cable Application Design

ADSS Installation Position Design





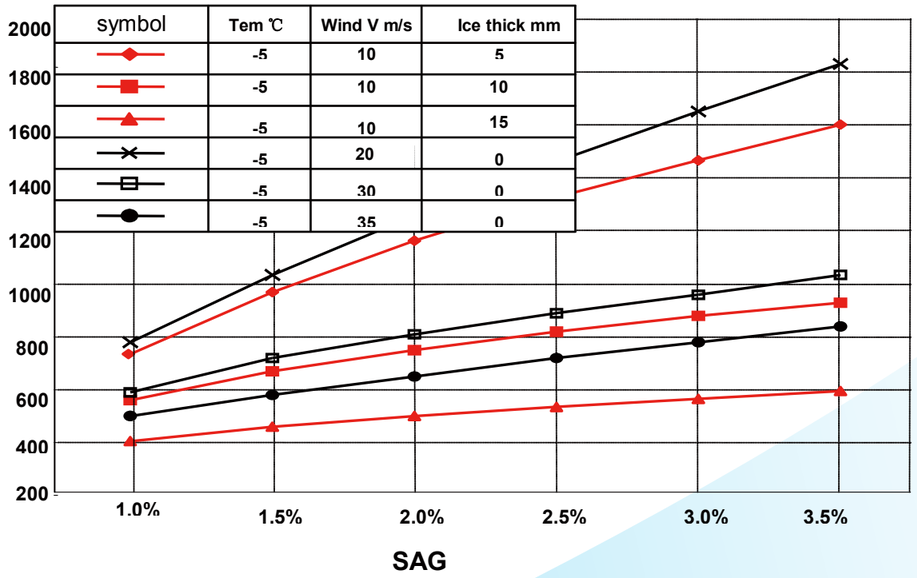
Description

To one individual pole or tower, the detail installation position design of ADSS cable is of great importance. An installation position not rightly suitable will influence cable operation life at least, or even leads a quick electric erode to cable.
Tongguang could provide spatial potentials distribution around the poles and towers, if it is required by customers.

In such case, following information should be available at least:
-- Voltage of the system and its possible maximum value;
-- Main structure size drawing of the pole or tower;
-- Diameter or type model of conductors and overhead ground wires;
-- Phase arrangement of conductors on the pole or tower;
-- The spacing size of split conductors (if it is the case);
-- The length of Insulator string

ADSS Cable Application Design

Span-tension-sag design for ADSS cables



ADSS cables have so-called “variable span” characteristics.
-- In case of fixed operational tension at two cable ends is required, allowable span for ADSS cables will increase along with increasing of allowable sag;
-- Under different weather conditions, the allowable span of same ADSS cable will reduce along with increasing of weather load to the cable.
On request, Tongguang could provide span-tension-sag characteristics of ADSS cable for customers.

Typical Structure and Parameter of ADSS

Some structures and characteristics of typical representative ADSS are shown in the below list, however, they do not represent the whole products of the company. If you have any requests, please contact local representative office or contact the company directly.

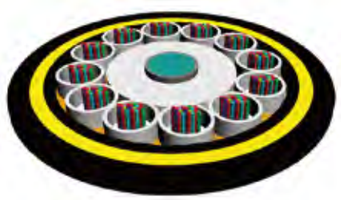
ADSS with grade A sheath (Parts)

Structure drawing	Order Type Model	ADSS-PE 24 M15.5/ A	ADSS-PE48 M17.7 / C	ADSS-PE72 M21.2 / D
	Fiber count	24	48	72
	Size of tube	ϕ 2.1mm	ϕ 2.6mm	ϕ 3.0mm
	Cable diameter	ϕ 13.4mm	ϕ 14.9mm	ϕ 16.4mm
	Cable weight	139kg/km	172kg/km	209kg/km
	RTS	38.8kN	44.3kN	56.6kN
	Linear expansion coefficient	2.2×10^{-6}/℃	2.0×10^{-6}/℃	1.8×10^{-6}/℃
	Young's modulus	16.5kN/mm^2	17.5kN/mm^2	18.6kN/mm^2

ADSS with grade B sheath (parts)

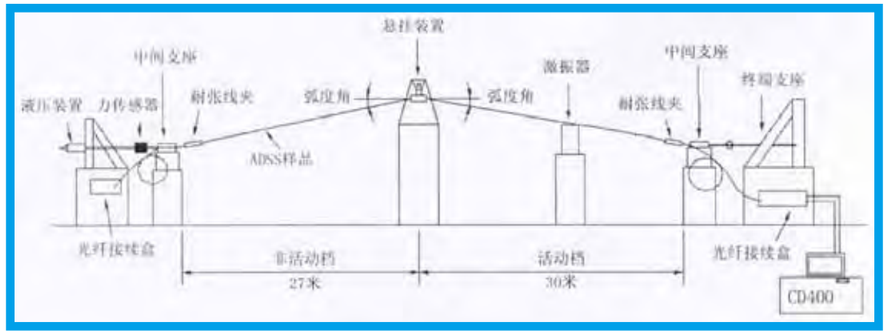
Structure drawing	Order Type Model	ADSS-AT 24 M14 / A	ADSS-AT48M15.2 / C	ADSS-AT72 M21.2 / D
	Fiber count	24	48	72
	Size of tube	ϕ 2.1mm	ϕ 2.6mm	ϕ 3.0mm
	Cable diameter	ϕ 13.2mm	ϕ 14.3mm	ϕ 16.3mm
	Cable weight	146kg/km	169kg/km	220kg/km
	RTS	35kN	37.9kN	52.9kN
	Linear expansion coefficient	4.5×10^{-6}/℃	4.8×10^{-6}/℃	3.6×10^{-6}/℃
	Young's modulus	15.5kN/mm^2	14.9kN/mm^2	17.9kN/mm^2

ADSS with grade B sheath (parts)

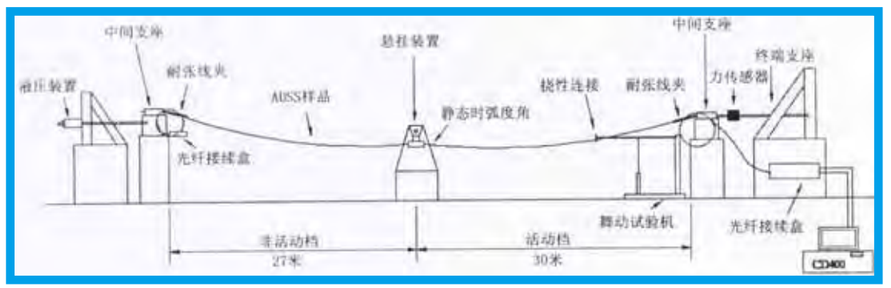
Structure Drawing	Order Type Model	ADSS-AT144 M12.3 / D
	Fiber count	144
	Size of tube	ϕ 3.0mm
	Cable diameter	ϕ 20.7mm
	Cable weight	344kg/km
	RTS	30.8kN
	Linear expansion coefficient	3.5×10-6/℃
	Young's modulus	6.22kN/mm^2

Test Report

Aeolian Vibration Test



Galloping Test



Test Result

Test Items	Test standard				
	IEEE P1222	IEC 60794-4	EN 60794-4	GB/T18899	DL/T 788
Stress-strain test	√	√	√	√	√
Tensile strength test	√	√	√	√	√
Crush test	√	√	√	√	√
Impact test	√	√	√	√	√
Torsion test	√	√	√	√	√
Repeated bending test	√	√	√	√	√
Temperature cycling test	√	√	√	√	√
Heat ageingtest	√	/	/	√	√
Water penetration test	√	√	√	√	√
Bleeding test (seepage of filling compound)	√	√	√	√	√
Aeolian vibration test	√	√	√	√	√
Galloping test	√	/	/	√	√
Sheave test	√	√	√	√	√
Creep test	√	/	/	√	√
UV resistance test	√	/	/	√	√
Tracking-resistant test	√	√	√	√	√
Shotgun resistance test	/	√	√	/	/
Wrap/low temperature bending test	/	/	/	√	√
Low temperature impact test	/	/	/	√	√

Network Access License

Ordering Information

Type model explaining:

ADSS — XX XX MXXX / X

- ADSS — Product name
- XX — Sheath grade: PE：grade A；AT：grade B
- XX — Cable fiber count of
- MXXX — Max operational tension (kN)
- X — Fiber count in optical unit A: 4；B:6；C:8；D:12

We could provide user structure design and type selection, if information is provided as below:

Weather condition			
	Temperature （℃）	Wind speed（m/s）	Ice thick （mm）
Lowest temperature			
Average temperature of year			
Max. wind speed			
Ice thickness			
Highest temperature			
Installation			

Electric line condition			
System voltage*	kV	Type model/diameter* of ground wire	mm
Length of insulator string*	mm	Type model/diameter* of conductor	mm
Name height of pole/tower	m	Split conductor/split spacer(y/no)	mm
Representative span*	m	Initial sag of wires*	%
Max span*	m	Max sag of wire*	%

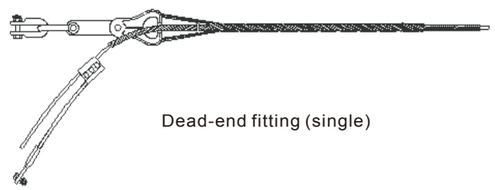
Main installation operation requirement to ADSS cable					
Installation sag*	%	Max sag	%	Min distance above ground*	m

Main transmission requirement to ADSS cable			
Fiber count*		Fiber type*	
attenuation*	dB/km(@1310nm);	dB/km(@1550nm);	
Chromatic dispersion	ps/nm.km(@1310nm);	ps/nm.km(@1550nm);	

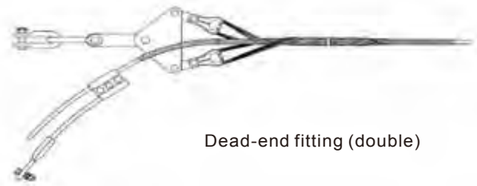
Note 1： In some case, detail information of poles and towers and cross section drawing of line is needed.
Note 2："*" represents information must be provided.

Hardware and Fittings for OPGW

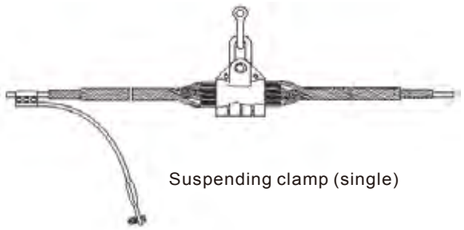
The drawings below are shown with no detail size. If you have any requests, please contact local representative office or contact the company directly.



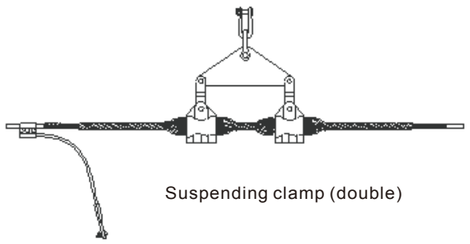
Dead-end fitting (single)



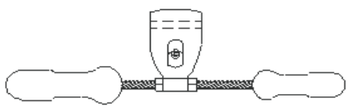
Dead-end fitting (double)



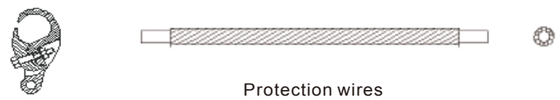
Suspending clamp (single)



Suspending clamp (double)

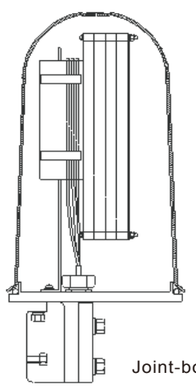


Vibration damper

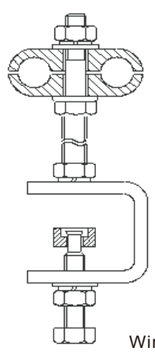


Protection wires

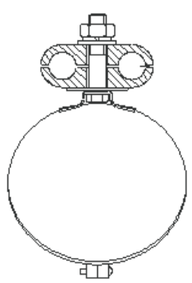
Earth wires



Joint-box



Wire clamp for tower



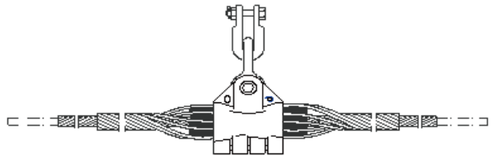
Wire clamp for pole

Hardware and Fittings for ADSS

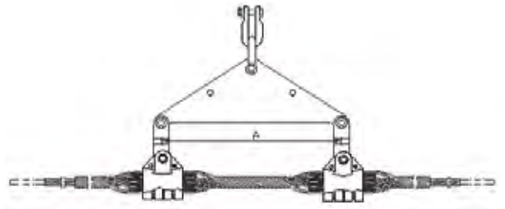
The drawings below are shown with no detail size. If you have any requests, please contact local representative office or contact the company directly.

Dead end clamp with double stranded

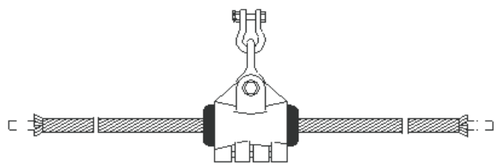
Dead end clamp with single stranded



Suspending clamp (single)



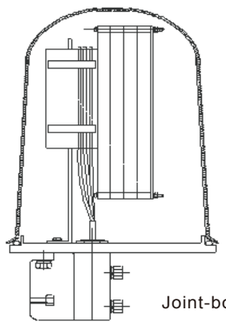
Suspending clamp (double)



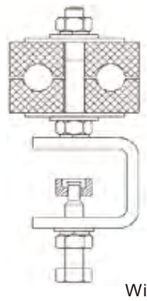
Tangent clamp

Spiral vibration reducer

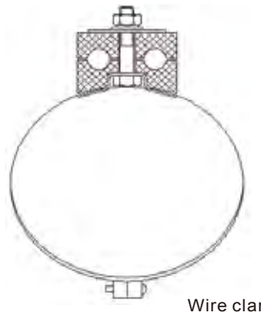
corona-resist ring



Joint-box



Wire clamp for tower

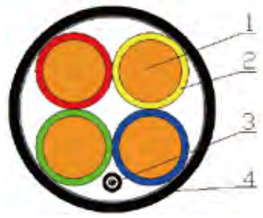


Wire clamp for pole

② Optical Composite Cable

Optical Composite Low-voltage Cable

Cross Section Drawing:



OPLC without armor

Armored OPLC

Figure 1 1 – conductor 2 – insulation 3 – optical unit 4 – sheath

Figure 2 1 – conductor 2 – insulation 3 – filling material 4 – inner bedding 5 – steel armored layer 6 – sheath 7 – optical unit

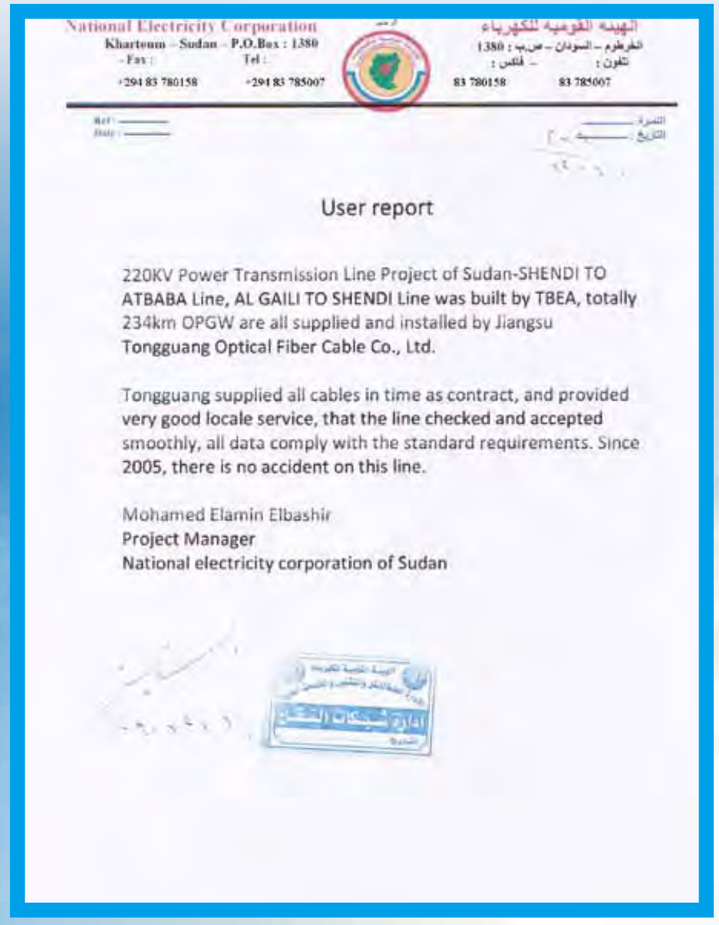
Features of OPLC (optical fiber composite low voltage cable):

① Integration of optical fiber and power cable, avoid twice cabling, decrease construction cost for network;
② Providing multi-kinds transmission means, high-flexibility, high-expandability, and wide applicability
③ Broadband accessible
④ Excellent shock resistance and crush resistance performance.
⑤ Without electric-magnetic interference between optical unit and power cable, has long term compatibility under operating temperature.

Application field:

Used for construction of electricity and fiber to the home (FTTH) for intelligent community and intelligent building, realize synchronous transmission of power and communication.

Performance certificate issued by the Enduser



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Ref :
Date :

الاشارة
التاريخ

User report

220KV Power Transmission Line Project of Sudan-SHENDI TO ATBABA Line, AL GAILI TO SHENDI Line was built by TBEA, totally 234km OPGW are all supplied and installed by Jiangsu Tongguang Optical Fiber Cable Co., Ltd.

Tongguang supplied all cables in time as contract, and provided very good locale service, that the line checked and accepted smoothly, all data comply with the standard requirements. Since 2005, there is no accident on this line.

Mohamed Elamin Elbashir
Project Manager
National electricity corporation of Sudan