

# SUBMARINE CABLE

Focuses on Precision Manufacturing





## ZTT GROUP

Jiangsu Zhongtian Technology Co., Ltd (ZTT), is a global cable and wire manufacturing entity established since 1992. From the start, ZTT entered the cable and wire industry with a core product of fiber optic cable and has since been famed as the “pioneer” in this industry. ZTT has always focus on high-value cable production. With its fame as “the first special optical fiber cable company

listed in China”, it was offered a listing on the Shanghai Stock Exchange on Oct 24, 2002. (stock code: 600522)

Progressive accumulation on production experience and constant upgrading in quality management system has led to rapid growth and plant expansion. ZTT now has 3 complete production chain of cable and wire.







ZTT sees its business as providing and conforming to industry standard of requirements for the many products it produces. To further enhance each cable product superiority, ZTT also produces accessories for cable installation, protection and termination. Two (2) strategic subsidiary companies were formed to focus on fitting designing, developing and manufacturing including an onsite service team.

ZTT has been labelled the “Cable factory with most active R&D” in China; Seven (7) numbers in total: Strategic Development Research Center, Optic Equipment Research Center, Submarine Cable Research Center, Material Research Center, Up-rating Conductor Research Center, Fiber Optics Research Center and New Energy Research Center. These centers has been the continuing source of ZTT’s sustainable growth for innovation development and has now been considered an integral arm of the ZTT Group.

Compelling industrial growth and speed of commercial and construction requirements has caused ZTT to spread its wings to 42 oversea offices and 2 manufacturing entity. One in India and another in Brazil.

Strong and resilient amidst global challenges, she has risen among the best in the industry for its excellent commitment to deliver global standard products.

With over 7000 staffs, ZTT products is now available globally to telecom operators, power grid, oil & gas and the renewable green energy sectors.

### **I.Optic Fiber chain:**

Preform, Optic Fiber Cable (duct, buried, aerial, FTTx, submarine), and generic product as: ADSS, OPGW, Down Well Fiber Optic Cable, Air Blown Fiber Optic Cable etc.

### **II.Aluminium Conductor chain:**

AAC, AAAC, ACSR, AVCSR.AW, ACAR, AACSR and generic product as: Thermal-resistant Aluminium Alloy Conductor, Invar Core Conductor, GAP Type Conductor and Annealed Aluminium Conductor.

### **III.Copper Cable chain:**

Radio Frequency Cable, Marine Cable, Offshore Cable, Power Cable and Submarine Power Cable.





## Submarine Cable Plant

### **Largest and most comprehensive manufacturing base for submarine cable in ASIA.**

Zhongtian Technology Submarine Cable Co., Ltd (ZTTSC) is a 100% owned subsidiary of the ZTT group. It is also by far the largest and most comprehensive manufacturing base for submarine cable in ASIA. It produces MV and HV Submarine Power or Composite Cable as well as Submarine Fiber Optic Cable.

ZTTSC was set up in 1999 with both R&D and world class manufacturing facilities and thus earned the “Pioneer” in Chinese submarine cable manufacturing history.

With heritage knowledge of fiber optic from ZTT, extensive research and analysis was carried out on cable mechanic performance with stimulated installation process. Soon, we developed our own technology for submarine fiber optic cable manufacturing. With the exception of traditional telecommunication operator market, ZTTSC submarine fiber optic cable has been sold globally and widely used for oil & gas seismic and oceanographic survey system.

Adding knowledge on cable mechanical performance and expert installation, together with matured technology





international berthing vessel. HVAC, HVDC and other customized multiple function submarine cable was also developed.

ZTTSC was invited and participated in almost all significant submarine cable projects in Chinese water. Her contribution to the submarine cable system in China can be found in most industries, which includes: offshore oil & gas, offshore green energy, submarine telecommunication system, seismic and oceanographic survey system. In China, ZTTSC is famed for being:

- The first subsea cable manufacturer to obtain the UJ certificate for submarine FO cable for repeater system
- The first subsea cable manufacturer to obtain the UQJ certificate for submarine FO cable for unrepeater system
- The first subsea cable manufacturer to supply 3cores, 110kv AC submarine cable
- The first subsea cable manufacturer to supply +/- 210kv DC submarine cable
- The biggest manufacturer to make export of submarine cable to international market

ZTT and ZTTSC plays more than just a significant role in the local market, together with other star development of China heavy industry; both contributes to the world an economical and yet stable solution of submarine cable system.

of XLPE insulation extrusion, advance manufacturing facilities and super clean compound from international acclaimed supplier; ZTTSC was soon accepted by local and international market for supply of submarine power and composite cable not only to oil & gas but electric grid companies as well.

Riding the benefits of the 2010 boom and offshore green energy demand, ZTTSC escalated its expansion plan and built the gigantic cable processing tower with 2nos VCV lines; a new cabling and armoring line and set up a huge multiple turntable and expanded our exclusive wharf to suit



## State-of-the-Art Manufacturing Facilities

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The plant locates by the threshold of the Yangtze River, one of the biggest river in the world and is accessible by various international vessel. ZTTSC had made this location its home base since 2004 and had been expanding and constantly upgrading its wharf facilities to accommodate new developments.

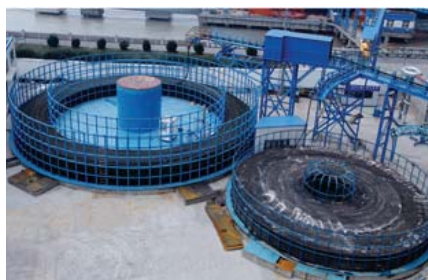
The plant is equipped with modern facilities suitable for long length submarine cable manufacturing. It includes 9 nos. dug-in storage spools for finished cable storage, and 2nos. large turntable of 20m (3500tons) & 30m (8000tons) diameter in open area for finished cable storage. There are also a number of in-house turntable for chain process storage of semi-finished products.

For submarine fiber optic manufacturing, there are 5nos. armoring line to support production of customized Submarine Fiber Optic Cable as per sea environment requirement.

The plant is set up with 2nos. VCV line, suitable for cable voltage of up to 500kV, and 2 nos. CCV line for cable voltage of less than 220kv. All equipment are suitable for extrusion of XLPE in triple processes with dry cooling system. Degassing system is equipped accordingly. Super clean raw material are obtained from International source of reputable brand and fed into the extruder through the Clean Class Room.

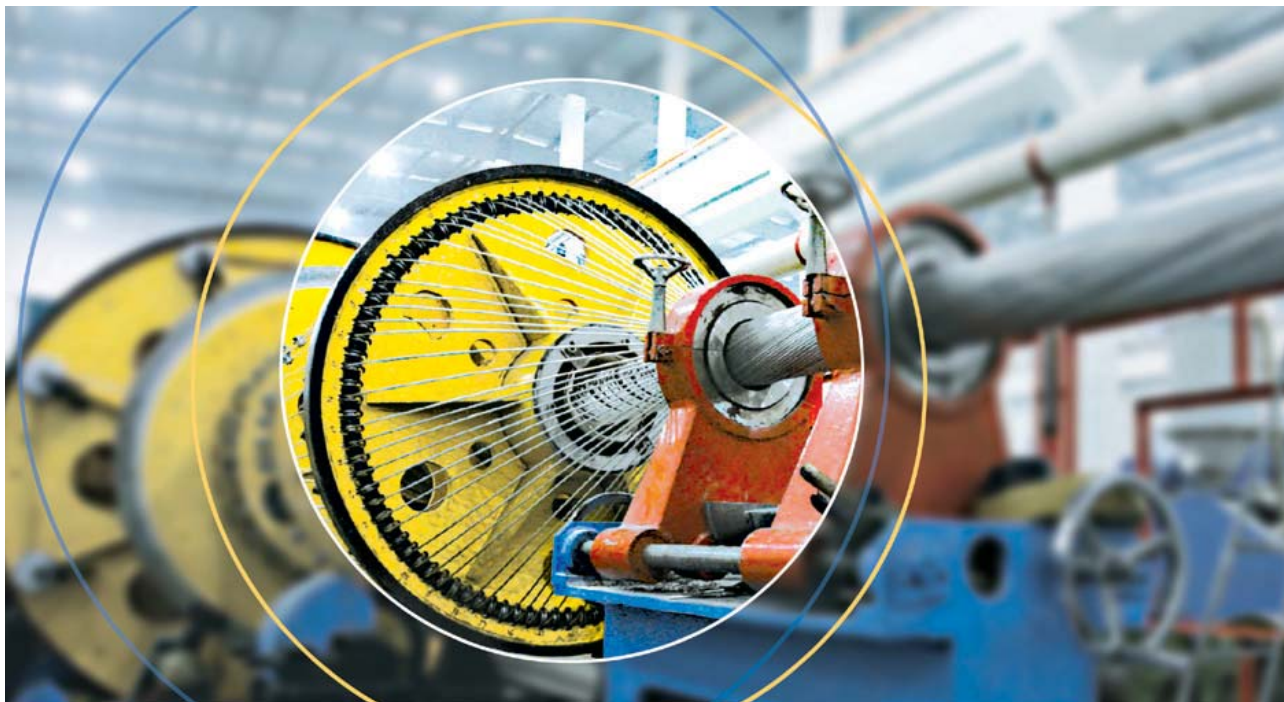
For Submarine Power or Composite Cable, the plant are equipped with 2 lay-up machines with either drum or turntable in order for chain process storage and finished cable storage, thus permitting production of long and continuous factory length of submarine cable. Applying controlled factory joints on each phase, the maximum length shall only be limited by the storage and carrying vessel's capacity.

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## No Compromise on QA & HSE



**Submarine cable is vital in any submarine cable system, and shall need the strictest quality assurance.**

Due to the costly breakdown, recovery and repair operation, submarine cable is always vital in any submarine cable system, and demands the strictest quality assurance, although the technology and material to produce submarine cable is a matured source for

submarine FO cable and MV submarine cable.

ZTTSC set up the quality assurance system as per ISO 9001:2008, incorporated his experience on manufacturing. The whole quality assurance system cover the design and engineering, raw material selection, manufacturing, and FAT, load out. ZTTSC also supply the service for site storage testing and maintenance.

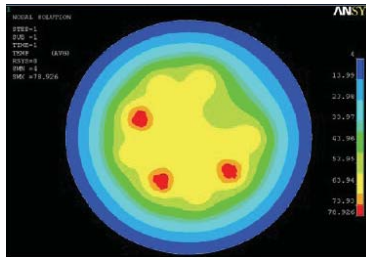
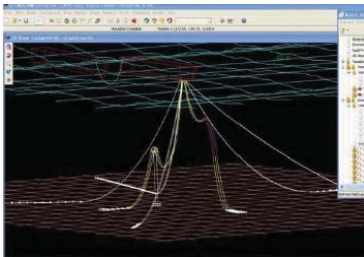


## No Compromise on QA & HSE

### Engineering verification

Although submarine power cable and submarine FO cable is by far a matured product; certain characteristics and criteria makes them super robust and yet delicate from normal cable and thus classify itself as a higher technological product. ZTT amasses great experience

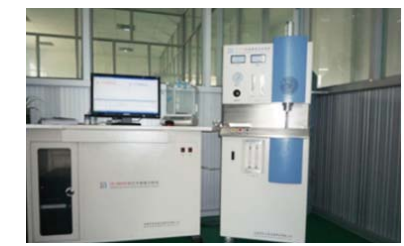
on various cable type design for its due purpose and performances. Certain industry computer are also used to assist in the designing and analyzing of results; eg. DNV Stableline, Fatfree, CableCAD, Orcaflex, Solidworks..etc.



### Raw material selection

Quality of raw material is a key determinant for guarantee of the tenure of submarine cable. Besides complying against regional standard requirement, ZTT maintained a stable list of qualified raw material supplier.

Internationally acclaimed brand for key material is always preferred. All imported material shall also be subjected to our in-house QC check for their desire quality.





## No Compromise on QA & HSE

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### Competence Testing Center

Product testing is an integral part of cable development and final cable delivery. ZTTSC possess a complete and competence test center within its plant especially for EHV test for HVAC and HVDC, and mechanical test like tensile and bending test, coiling, impact, crush, and also environment test, for example aging test, water penetration tests, etc.

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## Submarine Fiber Optic Cable



Submarine Fiber Optic cable are used to link islands, continents, offshore platforms, underwater equipment for seismic and oceanographic survey, etc.

### Design conception

ZTTSC submarine FO cables are based on stainless steel tube design, whether of central tube or stranded tubes. As our analysis determines; testing and accrual experience stainless steel tube performed better on its mechanical and environment resistance.

### Customized Submarine Fiber Optic cable

The sea condition is never the same or stable. Sea survey shall always be conducted and results ascertained for the right installation procedure and cable protection against undue damage by the rough current and or sea bottom rocks and corals. ZTTSC is able to provide such expertise in area of designing the correct protection of armor layering etc.

### UJ & UQJ certified cable

ZTT possesses 2 cable series which has been certified and registered in UJ consortium

S17 cable family provides 4 cable types and suitable for repeater system to water depth of 8000meter

Q10 cable family provides 7 cable types and suitable for repeaterless system to water depth of 3000meter.





## Submarine Fiber Optic Cable



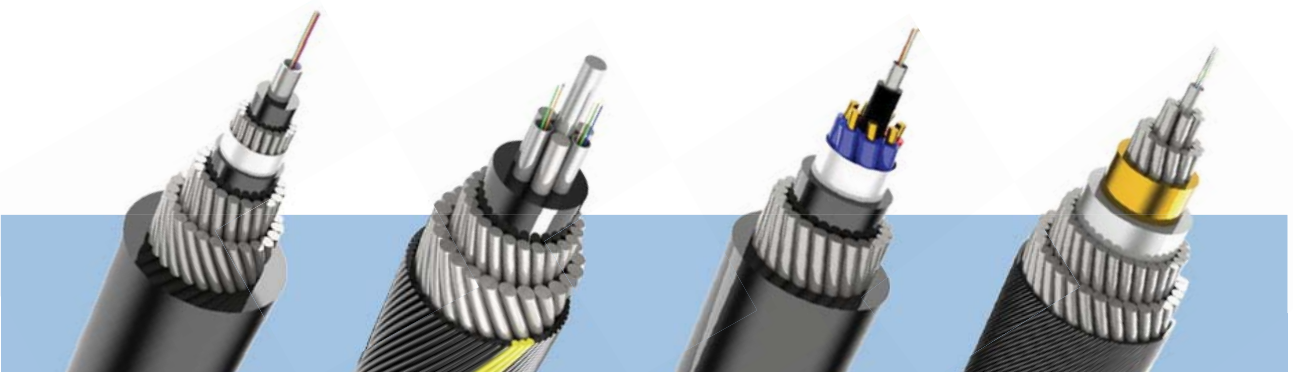
### ZTT submarine optic fiber cable is UJ & UQJ certified.

Thanks to the complete production chain on optic fiber and dedicated research work on submarine application. ZTT possess core knowledge on fiber performance, which attributes well to the submarine optic fiber cable development. ZTTSC submarine optic fiber cable links platforms, island, countries, river crossing and oceanographic observation stations, which cover

customers from telecoms, oil & gas and research units etc.

ZTTSC submarine optic fiber cable has been tested by various testing bodies and found to be performing above usual requirement and as such have been very well received.

- Up to 8000m water depth
- Unlimited delivery length
- Multiple armor layers
- Available for customization



# Submarine Fiber Optic Cable

## Sigle Armored Cable

Type	Nominal OD (mm)	Nominal weight (kg/m)		CBL (kN)	NTTS (kN)	NOTS (kN)	NPTS (kN)	Unloaded min.bending radius (m)	Crush (kN/100mm)	Impact (N·m)	Repeated bending (number)	Operational temp (°C)	Storage temp (°C)
		Air	In water										
SOFC-LW	17.0	0.62	0.40	80	50	30	20	0.5	>10	>100	50	-20~+50	-30~+60
SOFC-LWP	23.6	0.86	0.43	80	50	30	20	0.5	>10	>100	50	-20~+50	-30~+60
SOFC-SA	30.4	2.48	1.88	320	210	125	65	1.0	>20	>200	50	-20~+50	-30~+60
SOFC-DA	39.4	5.12	3.91	660	420	265	135	1.2	>40	>400	30	-20~+50	-30~+60

## Typical Technical Parameter of Shallow Sea SOFC

Type	Nominal OD (mm)	Nominal weight (kg/m)		CBL (kN)	NTTS (kN)	NOTS (kN)	NPTS (kN)	Unloaded min.bending radius (m)	Crush (kN/100mm)	Impact (N·m)	Repeated bending (number)	Operational temp (°C)	Storage temp (°C)
		Air	In water										
SOFC-SA	22	1.0	0.6	100	60	30	20	0.75	>20	>200	50	-20~+50	-30~+60
SOFC-SA	27	1.4	1.0	200	120	60	40	0.75	>20	>200	50	-20~+50	-30~+60
SOFC-SA	33	3.2	2.5	350	210	105	70	0.90	>20	>200	50	-20~+50	-30~+60
SOFC-DA	28	2.2	1.6	260	156	78	52	0.75	>30	>300	30	-20~+50	-30~+60
SOFC-DA	34	3.3	2.4	400	240	120	80	0.85	>40	>400	30	-20~+50	-30~+60
SOFC-DA	40	4.8	3.7	600	360	180	120	1.00	>40	>400	30	-20~+50	-30~+60
SOFC-DA	42	5.6	4.1	800	480	240	160	1.10	>40	>400	30	-20~+50	-30~+60
SOFC-RA	44	7.2	6.2	450	300	160	100	1.10	>40	>400	30	-20~+50	-30~+60



## Submarine Power Cable

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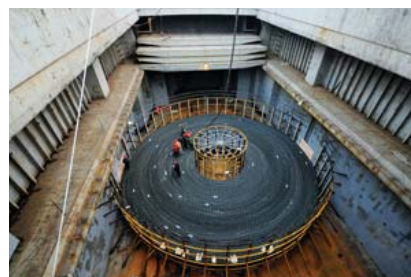


Submarine power cable are used for interconnection of offshore power fields, tidal wave locale, wind mill and offshore oil & gas platforms and also islands. The voltage for such application are usually less than 36kV AC type and typically uses the 3cores XLPE cables.

ZTTSC submarine power cable has been put to use in various sea conditions around the globe. From Alaska of USA, Yellow sea of China, South sea of China, Malaysia, Indonesia, Middle East, Mediterranean sea, Australia,

Mexico bay, Latin America, West coast of South America etc.

ZTTSC has equip flexible facilities to produce various cable structure; single phase or 3phase, lead sheath/ copper sheath/ aluminium sheath, single armor or double armor, polypropene yarn sheath or extruded sheath etc. The material are specifically selected for different cable structure to reach the specified performance.



## Submarine Power Cable



Zhuhai Guishan offshore wind farm demonstration project

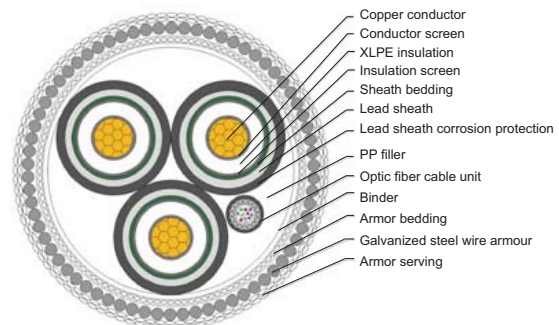
ZTTSC specializes in manufacturing long length submarine power (composite) cable.

ZTTSC has been qualified by major organization from oil & gas industry to offshore wind industry & EPC contractor

over all the world.

Adhering to strict QA system leads the way in our much of excellence in this business!

### Subsea Composite Power Cable (Lead Sheath)



### Subsea Composite Power Cable (Copper Tape + HDPE Sheath)



Typical design produce at ZTTSC.

- Lead sheath design
- Aluminium sheath design
- Extruded overall out sheath
- Double armor design



# Submarine Power Cable

## Copper(Aluminum)conductor corrugated aluminum sheath power cable (DC-YJLW03, DC-YJLLW03)

Rated Voltage	Nominal cross-sectional area (mm <sup>2</sup> )	Outer Dia. (mm)	Weight of Cable (kg/m)		Conductor resistance (Ω/km)		Current Load in earshot (A)		Short circuit current		Maxi.permissible tensile strength	
			Copper conductor	Aluminium conductor	Copper conductor	Aluminium conductor	Copper conductor	Aluminium conductor	Copper conductor	Aluminium conductor	Copper conductor	Aluminium conductor
200kV	240	84.3	7.0	5.5	0.0902	0.1500	506	393	27.6	18.2	16.8	9.6
	300	86.5	7.8	5.9	0.0719	0.1200	576	446	34.5	22.8	21.0	12.0
	400	89.7	9.0	6.5	0.0562	0.0934	664	516	46.0	30.4	28.0	16.0
	500	93.1	10.3	7.1	0.0438	0.0726	764	594	57.5	38.0	35.0	20.0
	630	96.3	11.7	7.8	0.0339	0.0563	884	686	72.5	47.9	44.1	25.2
	800	100.5	13.8	8.7	0.0264	0.0440	1018	789	92.0	60.8	56.0	32.0
	1000	104.5	16.0	9.7	0.0211	0.0349	1160	901	115.0	76.0	70.0	40.0
	1200	108.0	18.1	10.6	0.0181	0.0296	1270	992	138.0	91.2	84.0	48.0
	1400	111.3	20.2	11.4	0.0154	0.0254	1391	1083	161.0	106.4	98.0	56.0
	1600	114.4	22.3	12.3	0.0135	0.0223	1502	1169	184.0	121.6	112.0	64.0
250kV	400	108.9	11.8	9.3	0.0562	0.0934	653	507	46.0	30.4	28.0	16.0
	500	112.1	13.1	10.0	0.0438	0.0726	752	584	57.5	38.0	35.0	20.0
	630	115.9	14.8	10.9	0.0339	0.0563	869	674	72.5	47.9	44.1	25.2
	800	119.9	16.8	11.8	0.0264	0.0440	1003	777	92.0	60.8	56.0	32.0
	1000	123.9	19.1	12.9	0.0211	0.0349	1144	888	115.0	76.0	70.0	40.0
	1200	127.5	21.4	13.9	0.0181	0.0296	1252	978	138.0	91.2	84.0	48.0
	1400	130.8	23.6	14.8	0.0154	0.0254	1372	1068	161.0	106.4	98.0	56.0
	1600	133.9	25.8	15.8	0.0135	0.0223	1481	1153	184.0	121.6	112.0	64.0
	2000	139.6	30.2	17.6	0.0108	0.0179	1692	1313	230.0	152.1	140.0	80.0
320kV	500	128.2	15.8	12.6	0.0438	0.0726	747	580	57.5	38.0	35.0	20.0
	630	131.5	17.4	13.5	0.0339	0.0563	864	670	72.5	47.9	44.1	25.2
	800	135.4	19.5	14.5	0.0264	0.0440	995	771	92.0	60.8	56.0	32.0
	1000	139.4	21.9	15.6	0.0211	0.0349	1135	881	115.0	76.0	70.0	40.0
	1200	143.0	24.3	16.7	0.0181	0.0296	1243	971	138.0	91.2	84.0	48.0
	1400	146.3	26.6	17.7	0.0154	0.0254	1362	1061	161.0	106.4	98.0	56.0
	1600	149.4	28.8	18.8	0.0135	0.0223	1471	1145	184.0	121.6	112.0	64.0
	2000	155.1	33.3	20.7	0.0108	0.0179	1679	1303	230.0	152.1	140.0	80.0
	2500	161.4	38.7	23.0	0.0087	0.0152	1900	1438	287.5	190.1	175.0	100.0

Note: 1. 64/110kv, 127/220kv single core power cable use the nonmagnetic materials to armor. 2. Lead sleeve screen, single circuit, conductor operation temp=90℃ , earth temp=25℃ earth thermal resistance=1.0 km/W, buried depth 1.5m, air temp.=40℃ . 3. The reference value in the table can be changed according to the customer's requirements.

## HVAC Submarine Power Cable (Up to 500kV)

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Zhuhai demonstration project of offshore wind generation  
66nos. x3 MW, 198MW 42km, 110kV



HV submarine power cable is specially developed for long distance transmission. To lower CO<sub>2</sub> emission, green energy has been developed fast, in Asia and Europe, offshore wind mill has created huge demand and development of HV submarine cable, both HVAC and HVDC.

For HVAC, ZTTSC has equipped a tower with 2VCV lines for XLPE extrusion, a vertical turntable lay-up machine, multiple in-house turntable for semi-finished core, big outside turntable for finished cable, movable factory joint room, movable degassing tent, all in all, is specially for 3 phase HV AC cable. Now we can produce up to 500kV.





## HVAC Submarine Power Cable

Copper XLPE insulated separately lead sheathed thick/non-magnetic steel wire armored fiber serving submarine power cable and submarine composite poser and fiber optic cable(ZS-YJQF41, ZS-YJQF41+OFC)

Specifications		Approx. conductor diameter	Nominal insulation thickness	Nominal armor steel wire dia.	Approx. OD	Approx. weight	Conductor resistance		Capacitance	Inductance	Ampacity		Short circuit current	
							DC 20°C	AC 90°C			Air	Earth	Conductor	Screen
		mm	mm	mm	mm	kg/km	Ω/km	Ω/km	μF/km	mH/km	A	A	kA	kA
8.7/10 kV 8.7/15 kV	3×50	8.2	4.5	5.0	82	16.1	0.387	0.494	0.213	0.438	194	193	7.2	2.3
	3×70	10.0	4.5	5.0	86	18.0	0.268	0.342	0.242	0.412	240	235	10.0	2.5
	3×95	11.6	4.5	5.0	90	19.8	0.193	0.246	0.267	0.393	288	278	13.6	2.9
	3×120	13.0	4.5	5.0	93	21.5	0.153	0.196	0.289	0.379	328	314	17.2	3.0
	3×150	14.4	4.5	5.0	96	23.3	0.124	0.159	0.311	0.367	369	348	21.5	3.4
	3×185	16.2	4.5	5.0	100	25.6	0.0991	0.127	0.339	0.354	418	389	26.5	3.6
	3×240	18.4	4.5	5.0	105	28.9	0.0754	0.0976	0.374	0.341	481	441	34.3	4.1
	3×300	20.6	4.5	5.0	111	32.4	0.0601	0.0778	0.408	0.331	542	489	42.9	4.4
	3×400	23.5	4.5	5.0	120	38.2	0.0470	0.0614	0.466	0.324	614	541	57.2	5.2
12/20 kV	3×50	8.2	5.5	5.0	87	17.6	0.387	0.494	0.185	0.453	196	193	7.2	2.7
	3×70	10.0	5.5	5.0	91	19.4	0.268	0.342	0.208	0.425	242	235	10.0	2.9
	3×95	11.6	5.5	5.0	94	21.4	0.193	0.246	0.229	0.405	290	279	13.6	3.3
	3×120	13.0	5.5	5.0	97	23.1	0.153	0.196	0.247	0.391	331	314	17.2	3.5
	3×150	14.4	5.5	5.0	101	25.0	0.124	0.159	0.265	0.379	372	349	21.5	3.6
	3×185	16.2	5.5	5.0	105	27.4	0.0991	0.127	0.289	0.367	421	389	26.5	4.1
	3×240	18.4	5.5	5.0	110	30.8	0.0754	0.0976	0.317	0.352	485	441	34.3	4.4
	3×300	20.6	5.5	5.0	115	34.3	0.0601	0.0778	0.345	0.341	545	488	42.9	4.9
	3×400	23.5	5.5	5.0	125	40.2	0.0470	0.0614	0.392	0.333	616	540	57.2	5.8
18/30 kV	3×50	8.2	8.0	5.0	98	21.6	0.387	0.494	0.143	0.485	200	196	7.2	3.5
	3×70	10.0	8.0	5.0	102	23.5	0.268	0.342	0.160	0.456	246	238	10.0	3.9
	3×95	11.6	8.0	5.0	106	25.7	0.193	0.246	0.175	0.435	294	281	13.6	4.1
	3×120	13.0	8.0	5.0	109	27.6	0.153	0.196	0.188	0.420	335	316	17.2	4.3
	3×150	14.4	8.0	5.0	113	29.6	0.124	0.159	0.200	0.406	376	348	21.5	4.8
	3×185	16.2	8.0	5.0	117	32.0	0.0991	0.127	0.217	0.392	423	388	26.5	5.0
	3×240	18.4	8.0	5.0	122	35.6	0.0754	0.0976	0.236	0.377	488	439	34.3	5.6
	3×300	20.6	8.0	5.0	127	39.4	0.0601	0.0778	0.256	0.364	547	485	42.9	6.3
	3×400	23.5	8.0	5.0	137	45.6	0.0470	0.0614	0.289	0.355	619	537	57.2	6.9
26/35 kV	3×50	8.2	10.5	5.0	110	26.1	0.387	0.494	0.121	0.514	203	197	7.2	4.6
	3×70	10.0	10.5	5.0	114	28.3	0.268	0.342	0.134	0.483	250	239	10.0	4.9
	3×95	11.6	10.5	5.0	118	30.4	0.193	0.246	0.146	0.461	298	281	13.6	5.4
	3×120	13.0	10.5	5.0	121	32.4	0.153	0.196	0.156	0.445	339	315	17.2	5.6
	3×150	14.4	10.5	5.0	124	34.5	0.124	0.159	0.166	0.431	380	350	21.5	5.8
	3×185	16.2	10.5	5.0	129	37.1	0.0991	0.127	0.178	0.415	428	388	26.5	6.4
	3×240	18.4	10.5	5.0	134	41.0	0.0754	0.0976	0.193	0.399	493	440	34.3	6.7
	3×300	20.6	10.5	5.0	139	44.9	0.0601	0.0778	0.209	0.385	551	484	42.9	7.4
	3×400	23.5	10.5	5.0	149	51.5	0.0470	0.0614	0.234	0.374	623	537	57.2	8.4

## HVAC Submarine Power Cable

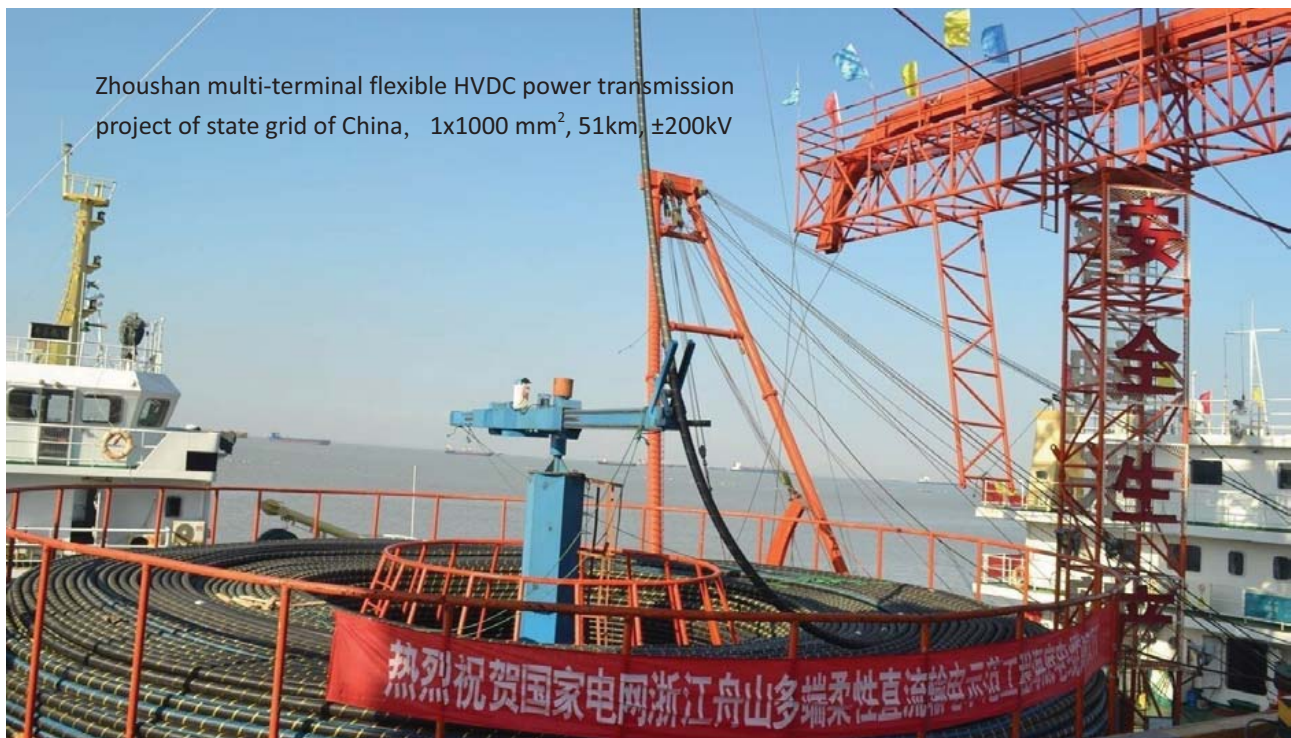
Copper XLPE insulated separately lead sheathed thick/non-magnetic steel wire armored pp yarn outer serving submarine power cable and submarine composite power and fiber optic cable(ZS-YJQF41, ZS-YJQF41+OFC)

Specifications		Approx. conductor diameter	Nominal insulation thickness	Nominal armor steel wire dia.	Approx. OD	Approx. weight	Conductor resistance		Capacitance	Inductance	Ampacity		Short curcit current	
							DC 20°C	AC 90°C			Air	Earth	Conductor	Screen
		mm	mm	mm	mm	kg/km	Ω/km	Ω/km	μF/km	mH/km	A	A	kA	kA
48/66 kV	3×95	11.6	13.0	6.0	134	36.3	0.193	0.246	0.120	0.486	318	261	13.6	6.9
	3×120	13.0	13.0	6.0	137	38.7	0.153	0.196	0.127	0.469	354	289	17.2	7.5
	3×150	14.4	13.0	6.0	140	40.9	0.124	0.159	0.135	0.455	389	316	21.5	7.7
	3×185	16.2	13.0	6.0	145	43.9	0.0991	0.127	0.144	0.438	429	346	26.5	8.4
	3×240	18.4	13.0	6.0	150	47.1	0.0754	0.0976	0.156	0.420	481	386	34.3	8.8
	3×300	20.6	13.0	6.0	155	51.4	0.0601	0.0778	0.167	0.406	525	419	42.9	9.6
64/110 kV	1×240	18.4	19.0	5.0	111	28.0	0.0754	0.0970	0.125	2.180	553	527	34.8	13.4
	1×300	20.6	18.5	5.0	112	29.4	0.0601	0.0777	0.135	2.150	612	612	43.4	13.6
	1×400	23.5	17.5	5.0	113	31.3	0.0470	0.0613	0.151	2.120	681	681	57.7	14.4
	1×500	26.6	17.0	5.0	115	33.5	0.0366	0.0484	0.167	2.090	752	752	72.1	14.8
	1×630	30.2	16.5	5.0	119	36.7	0.0283	0.0383	0.185	2.060	830	830	90.8	15.9
	1×800	34.5	16.0	5.0	123	39.5	0.0221	0.0309	0.207	2.030	909	909	115.1	17.4
	1×1000	38.5	16.0	5.0	127	43.3	0.0176	0.0257	0.223	2.000	983	983	143.8	18.9
	3×240	18.4	19.0	6.0	191	69.7	0.0754	0.0973	0.127	0.430	526	452	34.8	13.4
	3×300	20.6	18.5	6.0	194	72.3	0.0601	0.0782	0.137	0.408	593	501	43.4	13.6
	3×400	23.5	17.5	6.0	196	76.3	0.0470	0.0617	0.153	0.436	671	558	57.7	14.4
	3×500	26.6	17.0	6.0	201	81.2	0.0366	0.0491	0.169	0.416	757	618	72.1	14.8
	3×630	30.2	16.5	6.0	209	89.3	0.0283	0.0392	0.187	0.400	846	679	90.8	15.9
	3×800	34.5	16.0	6.0	218	98.3	0.0221	0.0322	0.209	0.381	940	740	115.1	16.9
	3×1000	38.5	16.0	6.0	227	108.9	0.0176	0.0272	0.226	0.368	1026	795	143.8	17.7
127/220 kV	1×400	23.5	27.0	5.0	135	36.4	0.0470	0.0613	0.116	1.770	744	704	57.7	18.7
	1×500	26.6	27.0	5.0	138	38.2	0.0366	0.0484	0.124	1.740	840	780	72.1	19.3
	1×630	30.2	26.0	5.0	140	40.7	0.0283	0.0383	0.137	1.720	945	857	90.8	20.4
	1×800	34.5	25.0	5.0	143	42.9	0.0221	0.0309	0.152	1.690	1051	930	115.1	20.9
	1×1000	38.5	24.0	5.0	145	45.3	0.0176	0.0257	0.168	1.670	1186	991	143.8	21.3
	1×1200	44.4	24.0	5.0	151	48.8	0.0151	0.0200	0.184	1.640	1290	1085	172.5	23.4
	1×1400	47.4	24.0	5.0	155	52.4	0.0129	0.0174	0.195	1.630	1373	1139	201.1	25.2
	1×1600	50.0	24.0	5.0	158	55.9	0.0113	0.0154	0.202	1.620	1444	1184	229.8	26.7
	3×400	23.5	27.0	6.0	245	100	0.0470	0.0616	0.116	0.485	673	563	57.7	18.7
	3×500	26.6	27.0	6.0	252	106	0.0366	0.0488	0.124	0.467	761	626	72.1	19.3
	3×630	30.2	26.0	6.0	256	113	0.0283	0.0389	0.137	0.444	855	690	90.8	20.4
	3×800	34.5	25.0	6.0	261	120	0.0221	0.0317	0.152	0.420	951	753	115.1	20.9
	3×1000	38.5	24.0	6.0	265	128	0.0176	0.0268	0.168	0.402	1038	809	143.8	21.3

Note: 1. Lead sleeve screen, single circuit, conductor operation temp=90℃, earth temp=25℃ earth thermal resistance=1.0 km/W, buried depth 1.5m, air temp=40℃. 2. The reference value in the table can be changed according to the customer's requirements.

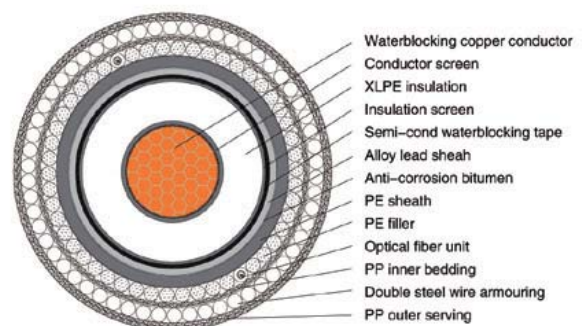
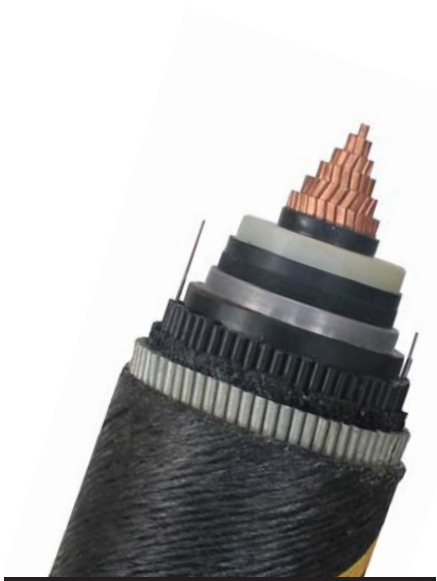


## HVDC Submarine Power Cable (Up to $\pm 320\text{kV}$ )



ZTT HVDC submarine cable is based on XLPE insulation, used on VSC (Voltage-Source Converter) system. Up to now, we can produce up to  $\pm 320\text{kV}$  HVDC.

We have in-house capability to design the cable, and make full analysis. ZTT has made the highest standards in engineering design quality assurance, manufacturing and testing in China market.



# HVDC Submarine Power Cable

## Submarine optic fiber composite power cable (DC-HYJQ41-F)

Rated Voltage	Nominal cross-sectional area (mm <sup>2</sup> )	Outer Dia. (mm)	Weight of Cable (kg/m)		Conductor resistance (Ω/km)		Current Load (A)		Short circuit current		Min.Bending Radius(mm)	Maxi.permissible tensile strength
			at Air	In Marine	DC 20℃	DC 70℃	Air	Earth	conductor	metallic shield		
80kV	70	69.3	10.2	6.8	0.268	0.321	270	283	8.1	3.9	1387	65
	95	71.1	10.8	7.3	0.193	0.231	327	339	10.9	4.2	1422	67
	120	72.7	11.5	7.7	0.153	0.183	376	387	13.8	4.5	1454	69
	150	74.5	12.2	8.3	0.124	0.148	427	436	17.3	4.8	1489	71
	185	76.3	13.0	8.9	0.0991	0.1186	488	494	21.3	5.1	1525	73
	240	78.8	14.2	9.8	0.0754	0.0902	575	576	27.6	5.6	1576	77
	300	81.5	15.4	10.7	0.0601	0.0719	662	655	34.5	6.2	1630	79
	400	84.9	17.2	12.1	0.0470	0.0562	771	754	46.0	6.9	1697	82
	500	88.8	19.4	13.8	0.0366	0.0438	895	866	57.5	7.7	1777	88
	630	92.8	21.7	15.6	0.0283	0.0339	1048	1001	72.5	8.6	1857	92
100kV	95	76.8	12.5	8.3	0.193	0.231	322	334	10.9	5.3	1535	75
	120	78.4	13.0	8.7	0.153	0.183	370	381	13.8	5.6	1568	76
	150	80.1	13.9	9.4	0.124	0.148	421	429	17.3	6.0	1603	79
	185	81.9	14.7	10.0	0.0991	0.1186	481	487	21.3	6.3	1639	81
	240	84.5	15.9	10.8	0.0754	0.0902	566	568	27.6	6.9	1690	82
	300	86.9	17.2	11.9	0.0601	0.0719	650	646	34.5	7.4	1739	86
	400	90.5	19.1	13.3	0.0470	0.0562	759	744	46.0	8.3	1811	90
	500	93.7	20.9	14.6	0.0366	0.0438	882	856	57.5	9.0	1874	92
	630	98.5	23.5	16.7	0.0283	0.0339	1031	989	72.5	10.2	1970	98
	800	103.2	26.6	19.1	0.0221	0.0264	1203	1139	92.0	11.5	2064	104
160kV	185	93.5	18.2	12.1	0.0991	0.1186	469	476	21.3	9.1	1871	92
	240	96.1	19.6	13.1	0.0754	0.0902	552	556	27.6	9.7	1922	96
	300	98.6	20.9	14.0	0.0601	0.0719	633	632	34.5	10.4	1971	98
	400	102.2	23.0	15.6	0.0470	0.0562	739	729	46.0	11.4	2044	102
	500	106.0	25.3	17.3	0.0366	0.0438	857	838	57.5	12.4	2120	108
	630	109.7	27.7	19.2	0.0283	0.0339	1002	968	72.5	13.5	2195	112
	800	114.0	30.7	21.5	0.0221	0.0264	1166	1114	92.0	14.8	2281	116
	1000	118.8	34.2	24.2	0.0176	0.0211	1342	1268	115.0	16.3	2375	122
	1200	122.9	37.6	27.0	0.0151	0.0181	1483	1387	138.0	17.7	2457	128

Note: Design condition is conductor operating temp=70℃ , power conductor max short circuit tem.=160℃ , earth tem.=25℃ , earth thermal resistivity 1.2 km/W buried depth 2m, air temp.=40℃ no solar radiation, fiber core 0°~96°. The recommended data in the table can be changed according to the project requirements.



# HVDC Submarine Power Cable

## Submarine optic fiber compodite power cable (DC-HYJQ41+OFC)

Rated Voltage	Nominal cross-sectional area (mm <sup>2</sup> )	Outer Dia. (mm)	Weight of Cable (kg/m)		Conductor resistance (Ω/km)		Current Load (A)		Short circuit current		Min.Bending Radius(mm)	Maxi.permissible tensile strength
			at Air	In Marine	DC 20℃	DC 70℃	Air	Earth	conductor	metallic shield		
±200kV	240	101.2	21.4	14.2	0.0754	0.0902	546	551	27.6	11.1	2025	102
	300	103.7	22.7	15.1	0.0601	0.0719	626	627	34.5	11.8	2074	104
	400	107.3	24.9	16.7	0.047	0.0562	730	723	46.0	12.9	2147	108
	500	111.5	27.3	18.5	0.0366	0.0438	847	830	57.5	14.0	2231	114
	630	115.3	29.8	20.4	0.0283	0.0339	989	960	72.5	15.2	2305	118
	800	119.6	33.0	22.9	0.0221	0.0264	1151	1105	92.0	16.6	2392	124
	1000	124.1	36.4	25.5	0.0176	0.0211	1326	1258	115.0	18.2	2482	128
	1200	128.2	39.9	28.3	0.0151	0.0181	1464	1376	138.0	19.6	2564	134
	1400	132.0	43.1	30.8	0.0129	0.0154	1615	1505	161.0	21.0	2639	137
	1600	135.5	46.3	33.4	0.0113	0.0135	1756	1623	184.0	22.4	2710	141
±250kV	400	122.1	32.1	21.6	0.0470	0.0562	714	710	46.0	17.0	2442	150
	500	125.3	34.2	23.1	0.0366	0.0438	829	818	57.5	18.1	2506	153
	630	129.0	36.9	25.2	0.0283	0.0339	968	945	72.5	19.4	2580	158
	800	133.7	40.6	28.0	0.0221	0.0264	1125	1087	92.0	21.1	2674	167
	1000	138.3	44.4	30.8	0.0176	0.0211	1295	1238	115.0	22.9	2765	172
	1200	142.3	48.0	33.6	0.0151	0.0181	1429	1355	138.0	24.5	2847	178
	1400	146.1	51.5	36.4	0.0129	0.0154	1576	1482	161.0	26.1	2922	184
	1600	149.6	54.7	38.9	0.0113	0.0135	1713	1599	184.0	27.6	2992	187
	2000	156.0	61.3	44.1	0.0090	0.0108	1975	1822	230.0	30.4	3120	195
±320kV	500	137.6	39.9	26.5	0.0366	0.0438	811	805	57.5	22.8	2753	170
	630	141.3	42.8	28.6	0.0283	0.0339	946	931	72.5	24.3	2827	175
	800	145.7	46.3	31.3	0.0221	0.0264	1101	1072	92.0	26.1	2913	181
	1000	150.2	50.4	34.4	0.0176	0.0211	1266	1221	115.0	28.1	3004	189
	1200	154.3	54.1	37.3	0.0151	0.0181	1397	1336	138.0	29.9	3086	195
	1400	158.1	57.6	39.9	0.0129	0.0154	1540	1462	161.0	31.6	3161	198
	1600	161.6	61.2	42.7	0.0113	0.0135	1673	1578	184.0	33.2	3231	204
	2000	168.0	68.0	48.0	0.0090	0.0108	1928	1798	230.0	36.3	3359	212
	2500	175.1	76.3	54.6	0.0073	0.0087	2204	2030	287.5	40.0	3503	223

Note: Design condition is conductor operating temp.=70℃ , power conductor Max short circuit tem.=160℃ , earth tem.=25℃ , earth thermal resistivity 1.2km/W buried depth 2m, air temp.=45℃ no solar radiation, fiber core 0~96, operating and storage environment temp. -20℃ ~+60℃ . The recommended data in the table can be changed according to the customer requirements.

# HVDC Submarine Power Cable

## Copper(Aluminum)conductor corrugated aluminum sheath power cable (DC-YJLW03, DC-YJLLW03)

Rated Voltage	Nominal cross-sectional area (mm <sup>2</sup> )	Outer Dia. (mm)	Weight of Cable (kg/m)		Conductor resistance (Ω/km)		Current Load in earshot (A)		Short circuit current		Maxi permissible tensile strength	
			Copper conductor	Aluminium conductor	Copper conductor	Aluminium conductor	Copper conductor	Aluminium conductor	Copper conductor	Aluminium conductor	Copper conductor	Aluminium conductor
80kV	70	40.9	4.0	3.6	0.321	0.532	252	196	8.1	5.3	4.9	2.8
	95	42.7	4.5	3.9	0.231	0.384	303	235	10.9	7.2	6.7	3.8
	120	44.2	4.9	4.2	0.183	0.304	345	268	13.8	9.1	8.4	4.8
	150	45.8	5.4	4.5	0.148	0.247	389	302	17.3	11.4	10.5	6.0
	185	47.5	6.0	4.8	0.119	0.197	442	343	21.3	14.1	13.0	7.4
	240	49.9	6.9	5.4	0.0902	0.1500	515	400	27.6	18.2	16.8	9.6
	300	52.2	7.8	5.9	0.0719	0.1200	586	454	34.5	22.8	21.0	12.0
	400	55.6	9.2	6.7	0.0562	0.0934	676	525	46.0	30.4	28.0	16.0
	500	59.4	10.8	7.6	0.0438	0.0726	777	603	57.5	38.0	35.0	20.0
	630	62.8	12.6	8.6	0.0339	0.0563	898	697	72.5	47.9	44.1	25.2
100kV	95	49.0	5.4	4.8	0.231	0.384	300	233	10.9	7.2	6.7	3.8
	120	50.5	5.9	5.2	0.183	0.304	342	266	13.8	9.1	8.4	4.8
	150	52.1	6.5	5.5	0.148	0.247	386	299	17.3	11.4	10.5	6.0
	185	53.8	7.1	5.9	0.119	0.197	437	340	21.3	14.1	13.0	7.4
	240	56.2	8.0	6.5	0.0902	0.1500	510	396	27.6	18.2	16.8	9.6
	300	58.5	8.9	7.0	0.0719	0.1200	581	449	34.5	22.8	21.0	12.0
	400	61.9	10.4	7.9	0.0562	0.0934	670	520	46.0	30.4	28.0	16.0
	500	65.7	12.1	8.9	0.0438	0.0726	770	598	57.5	38.0	35.0	20.0
	630	69.3	14.0	10.0	0.0339	0.0563	891	691	72.5	47.9	44.1	25.2
	800	73.3	16.3	11.3	0.0264	0.0440	1026	795	92.0	60.8	56.0	32.0
160kV	185	76.0	5.6	4.4	0.119	0.197	436	339	21.3	14.1	13.0	7.4
	240	78.2	6.3	4.8	0.0902	0.1500	509	395	27.6	18.2	16.8	9.6
	300	80.4	7.0	5.1	0.0719	0.1200	579	448	34.5	22.8	21.0	12.0
	400	83.6	8.2	5.7	0.0562	0.0934	668	518	46.0	30.4	28.0	16.0
	500	87.0	9.4	6.3	0.0438	0.0726	768	597	57.5	38.0	35.0	20.0
	630	90.2	10.9	6.9	0.0339	0.0563	888	689	72.5	47.9	44.1	25.2
	800	94.0	12.7	7.7	0.0264	0.0440	1023	793	92.0	60.8	56.0	32.0
	1000	98.0	14.9	8.6	0.0211	0.0349	1166	905	115.0	76.0	70.0	40.0
	1200	101.5	17.0	9.4	0.0181	0.0296	1276	996	138.0	91.2	84.0	48.0

Note: 1. 64/110kv, 127/220kv single core power cable use the nonmagnetic materials to armor. 2. Lead sleeve screen, single circuit, conductor operation temp=90℃ , earth temp=25℃ earth thermal resistance=1.0km/W, buried depth 1.5m, air temp.=40℃ . 3. The reference value in the table can be changed according to the customer's requirements.

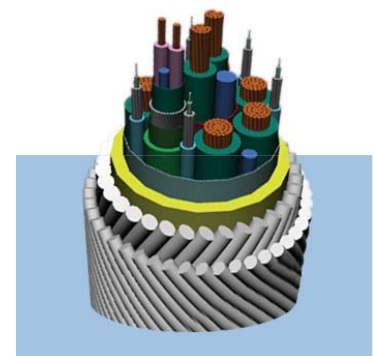
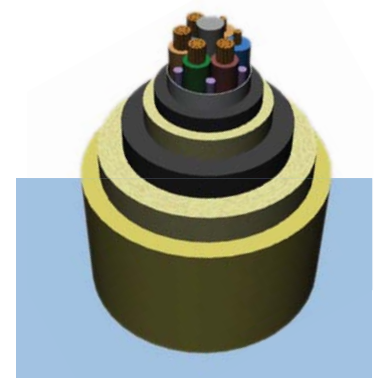
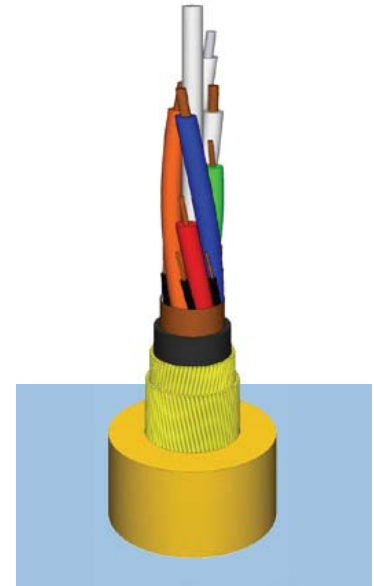


## ROV Cable

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ZTT has successfully developed ROV cable for National Development plan. Our design offers the compact electrical and fiber optic assembly and can be strengthened with either high strength synthetic fibers or multiple layers of armor wires to support the weight of ROV, handling and withstand vessel motion and tidal forces.

As with the ROV cable, ZTT has also developed and manufacture our own gimbal and wet connector.

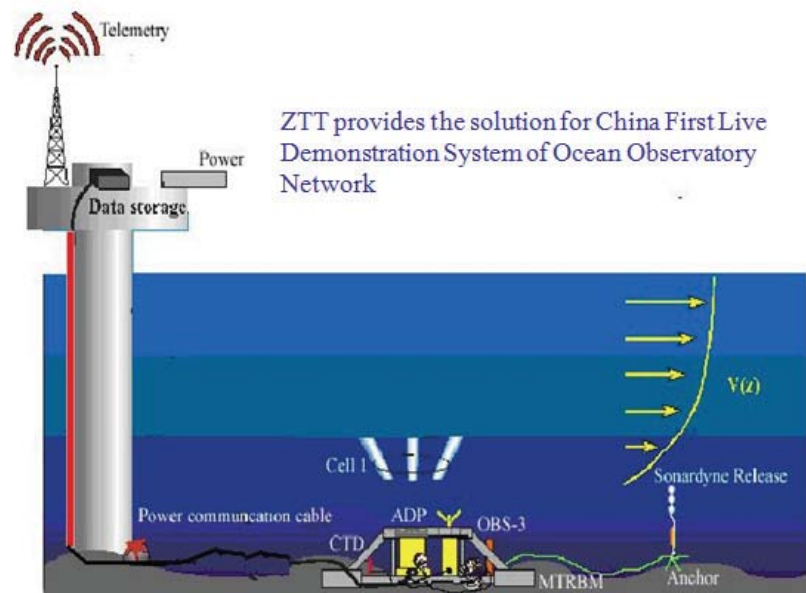


## Multiple Oceanographic Applications

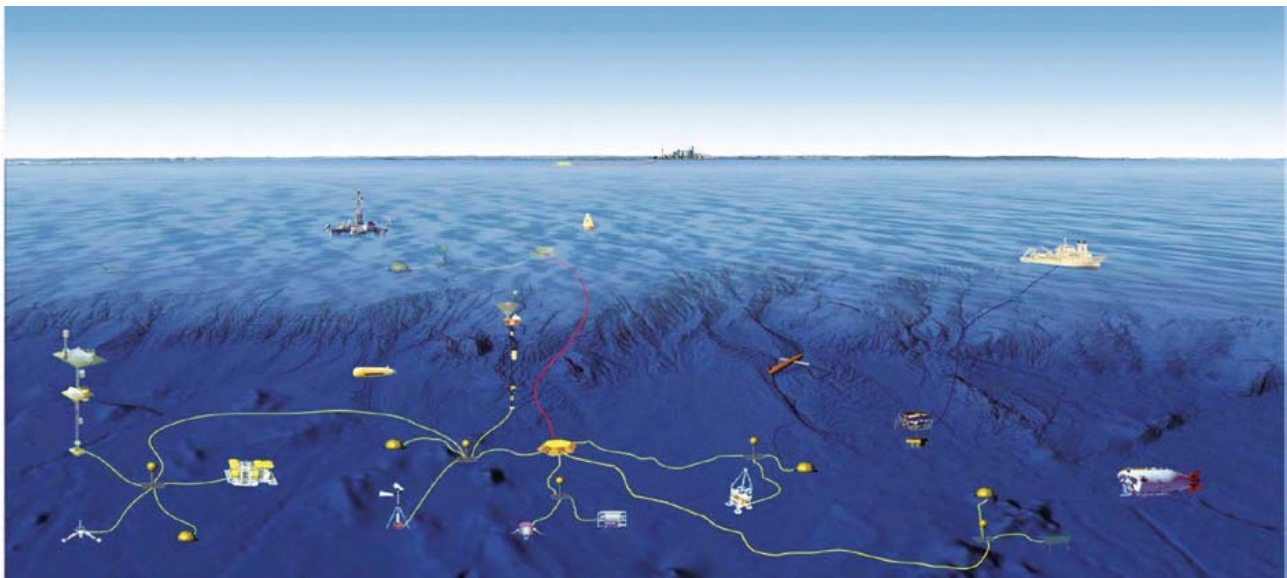
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ZTT has been a pioneer in the submarine cable industry. We could manufacture a wide range of cable products and possess great number of manufacturing and wharf facilities. Thanks to our capacity for submarine cable manufacturing and short processing time, we have been the first choice for our customers on any special qualified submarine cable products.

### Typical use in Ocean Observatory Network



### Submarine composite cables used in Ocean observatory network





## Professional Service

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### Logistics

Kilometers of submarine cable weighs much in weight tonnage even just for a single run. The challenge is always there for taking delivery. ZTT possess own harbor and lifting crane. With cable trays running 80meter from the factory or storage spools/ turntable and straight into the waiting vessel. Loading has never been time consuming. The harbor depth can receives vessel of up to 10000ton and slip right out into the international water or Shanghai International harbor; one of the biggest and busiest harbor in the world; with floating crane of more than 1000ton loading capacity, a favorite transshipment port.

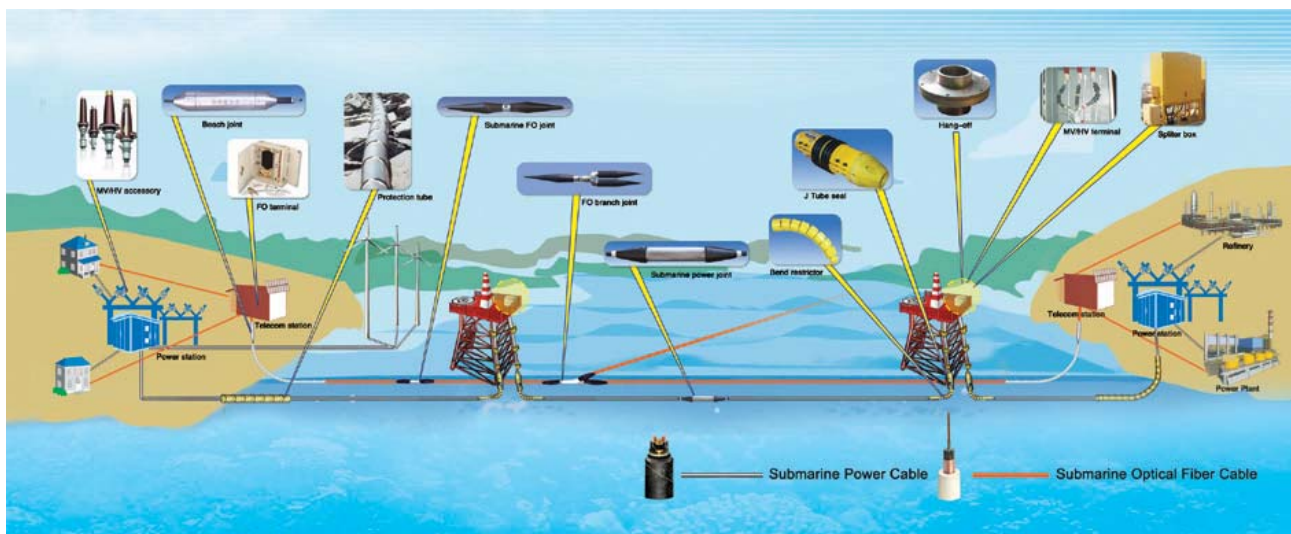


### Project management

Submarine cable business is never a one-time sale process. It encompasses an interfacing amongst the parties; end user, contractor, forwarder etc. ZTT project team can also offer project management from project kick off to commissioning.



## Professional Service



### One-Stop shop

To achieve a complete quality guarantee, and smooth project execution, ZTT provides a complete system of accessories for installation, protection, termination and maintenance; including technician for offshore assistance, supervision, training and field testing.



### On-site service

ZTT has a team of dedicated and highly experienced; qualified working engineers for on-site service; including

installation, supervision, accessory assembly, emergency repair, commissioning testing etc.





