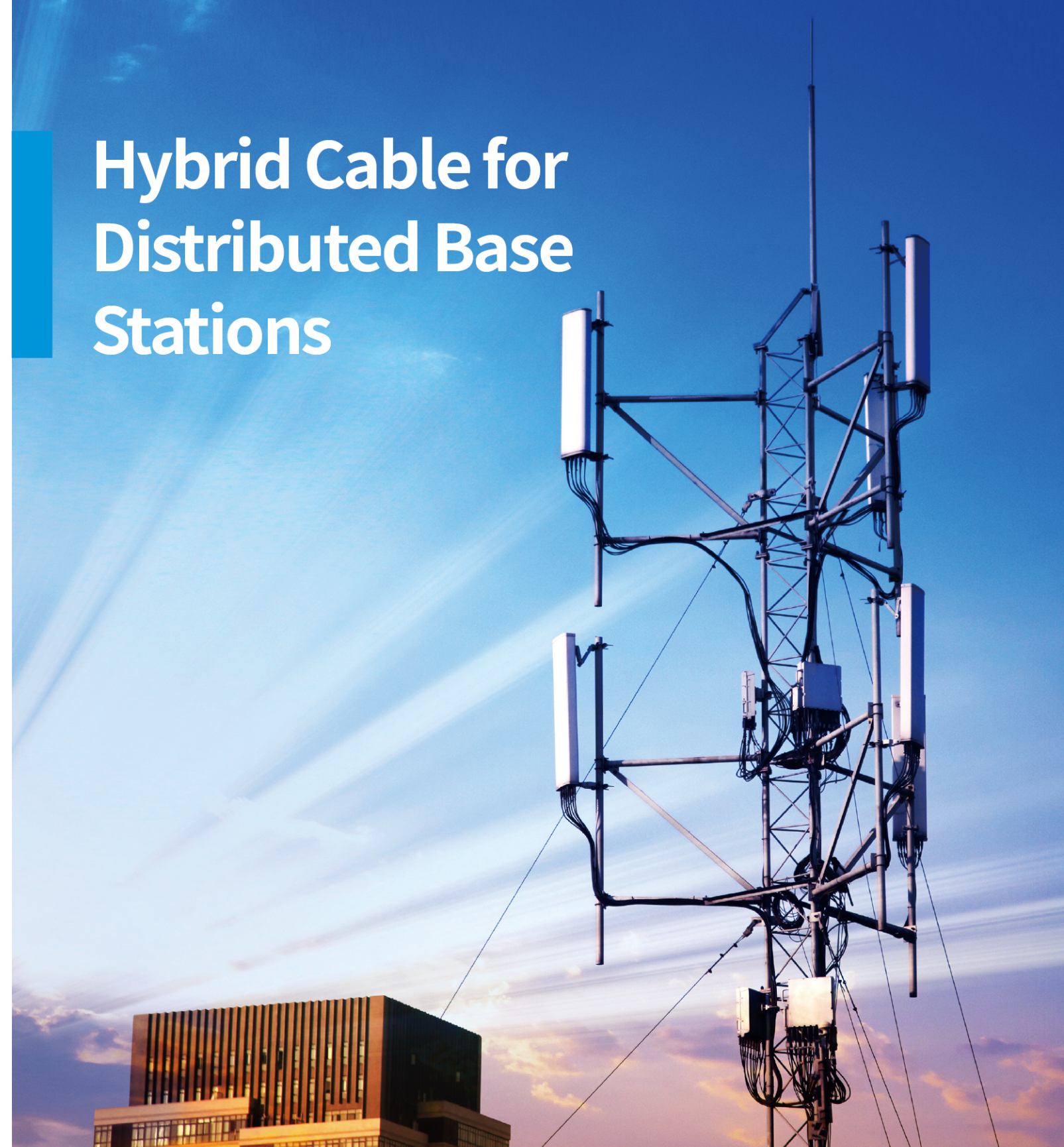


# Hybrid Cable for Distributed Base Stations



Yangtze Optical Fibre and Cable Joint Stock Limited Company

Stock Code: 601869.SH 06869.HK

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WeChat







Yangtze Optical Fibre and Cable Joint Stock Limited Company (also known as ‘YOFC’ ) is established in Wuhan, Hubei Province in May 1988. It’ s a technologically innovative enterprise specializing in optical fibre preforms, optical fibres, optical fibre cables and integrated solutions. It is also a global leading supplier of optical fibre preforms, optical fibres and optical fibre cables.

YOFC was listed on the Hong Kong Stock Exchange on December 10, 2014(Stock Code: 06869.HK), and listed on the Shanghai Stock Exchange on July 20, 2018 (Stock Code: 601869.SH), and is the only A&H shares company in China’ s optical fibre and cable industry as well as the first one in Hubei Province.

YOFC mainly produces and sells different types of optical fibre preforms, optical fibres and optical fibre cables that widely installed in telecommunications industry, customized specialty optical fibres and optical fibre cables, RF coaxial cables and accessories. YOFC also provides the integrated systems, project design and services. In addition, YOFC is equipped with a full series of optical fibres , optical fibre cables and solutions, providing a variety of different products and solutions for world’ s telecommunications industry and other industries (e.g. Public utility, Transportation, Oil & Chemistry and Medication etc.) and offering its products and services to over 70 countries and regions around the world.

Through introduction, digestion, absorption and re-innovation since its establishment, YOFC has carried out a way to successfully revitalize national industry. YOFC has mastered 3 types of optical fibre preform manufacturing technology (PCVD/OVD/VAD), and honored many awards & reputations such as National Enterprise Technical Center, National First Batch Intelligent Manufacturing Pilot Enterprise, the Second Class National Science and Technology Progress Award(3 times), the China Quality Award, the European Quality Award, etc. In addition, YOFC has obtained over 400 national-granted patents and several foreign invention patents from Europe, US and Japan, and was nominated the support organization for State Key Laboratory in optical fibre and optical fibre cable manufaction technology. It’ s also one of the significant members in ITU-T and IEC in setting international standards.

Adhering to the mission of ‘Smart Link Better Life’ , YOFC devotes itself to becoming the leader in information transmission and smart links through its core value ‘Client Focus Accountability Innovation Stakeholder Benefits’ , and builds its strategies in the following 5 aspects: Organic growth strategy of the preform, optical fibre and cable business; Strategy for technological innovation and smart manufacturing; Strategy for internationalization and expansion of business scope; Related diversification strategy; Capital operation strategy for synergy in development.

Solutions for 5G Business

With the construction of 5G networks and 'Broadband China', communication cables and equipments keep extending toward the subscribers. The power supply for equipments of remote base stations, communication rooms, access points for subscribers has become a tough problem. The solution of DC remote power supply by hybrid optical and electrical cables can not only facilitate the centralized construction and maintenance of power supply devices in the network, but also realize the efficient cable transmission of electric energy and optical signals. In addition to solving the aforesaid problems, the solution of DC remote power supply by hybrid optical and electrical cables can reduce the costs of construction and maintenance, and enhance efficiency.

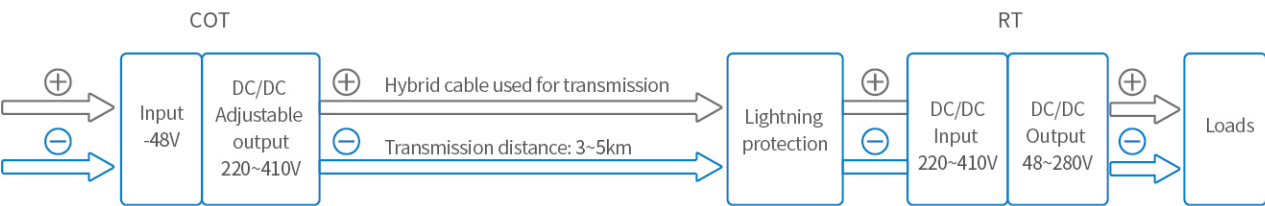
Principle of remote power supply

DC remote power supply system is consisted of central office terminal (COT) and remote terminal (RT). The power of COT can be boosted from DC 48V to DC 220~410V (adjustable) and transmitted to RT by hybrid optical and electrical cables, and then dropped to DC 48V (DC 280V might be converted to AC220V) to supply to the loads(RRU, optical fibre repeater, small micro base station, ONU, etc.). By this way, maintenance-free power is all-weather supplied.

Merits of remote power supply

Different solutions of remote power supply are available for different scenarios. Remote power supply has the following merites:

- The base station can work normally when the city electricity is failed
  - Complex work with the local power authority and subscribers for the connection to the city electricity are avoided
  - Extra costs for AC power supply are avoided
  - Site selection is flexible, not affected by city electricity
- Outdoor UPS is saved, and the costs for long-term power maintenance are saved
  - Hybrid cables are easy to install, with no need to install special electrical cables, saving route investments
  - Safe and reliable: the transmission lines are protected from open circuit, short circuit, power leakage, strong current and lightning, etc.

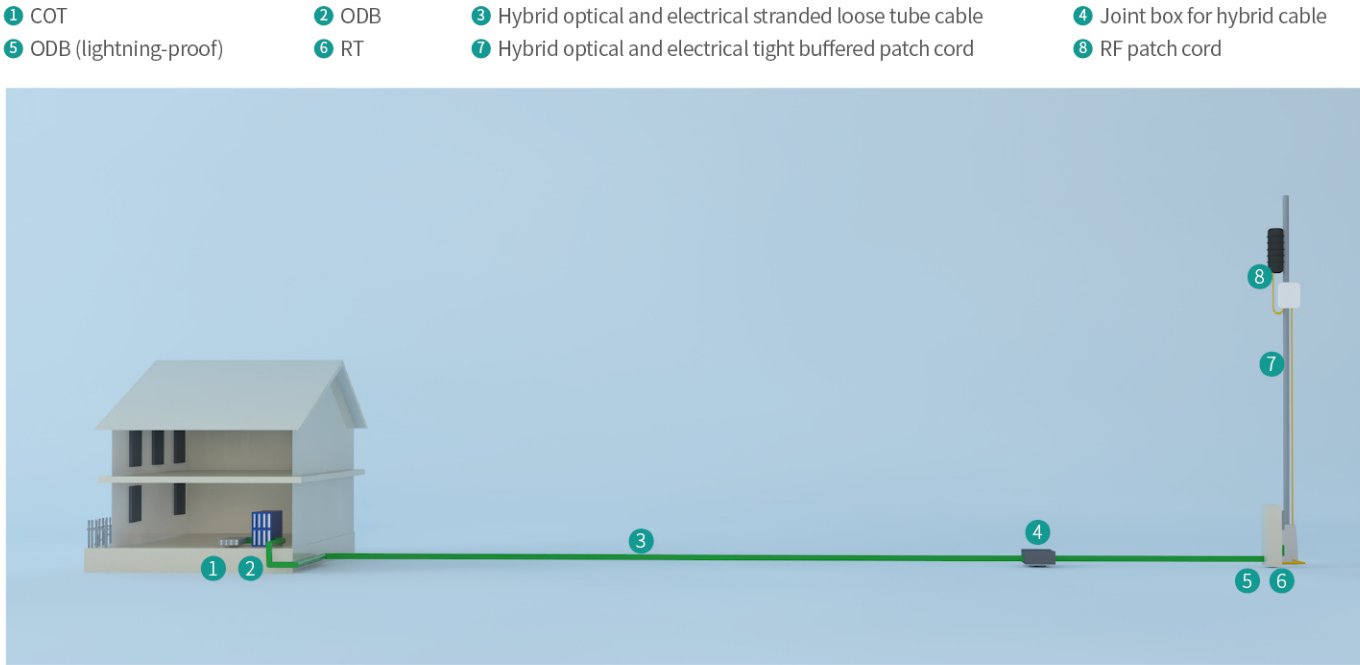


**Note:** 1. COT: Central Office Terminal  
2. RT: Remote Terminal  
3. RRU: Radio Remote Unit  
4. ONU: Optical Network Unit  
5. UPS: Uninterrupted Power Supply  
6. ODB: Optical Distribution Box  
7. RF: Radio Frequency

Applications

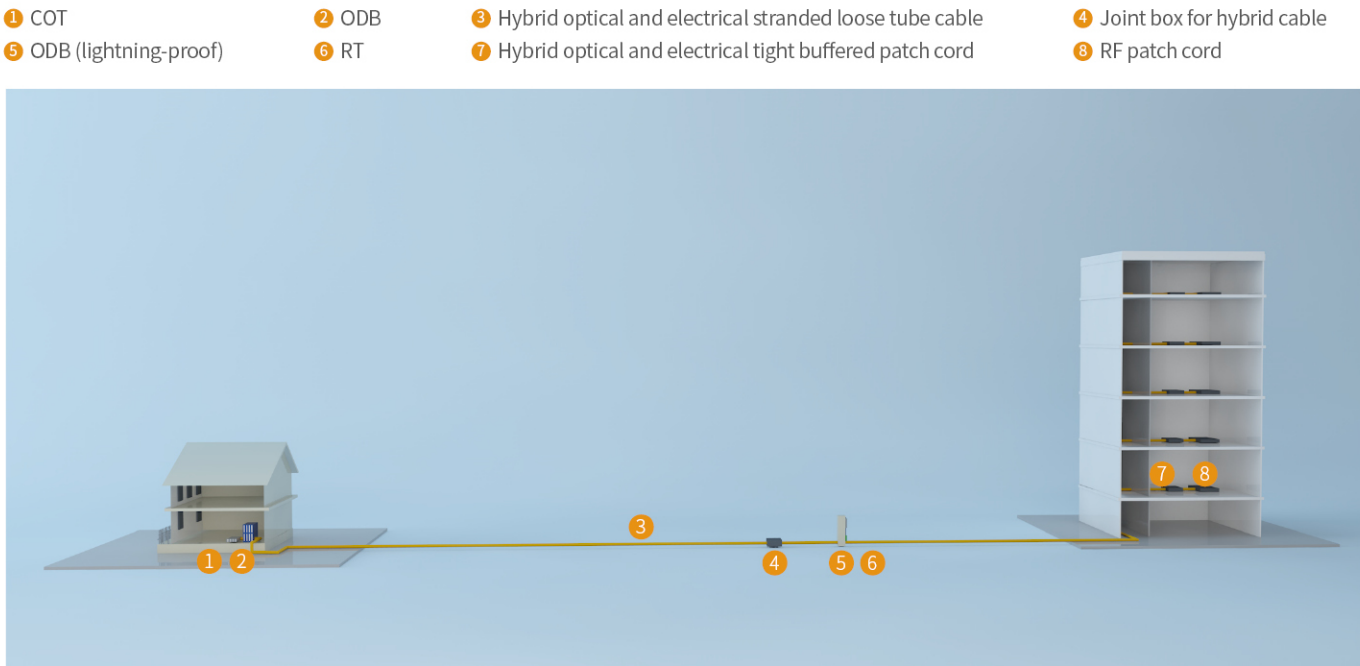
1. Point-to-point

- Scenario: network with single RRU or multiple RRUs
- Applicable to the situation where RT devices are gathered at one point but far away from COT.



2. Point-to-multipoint

- Scenario: indoor 5G coverage
- Applicable to the situation where RT devices are scattered far away.



3. Cascade

- Scenario: network covering highways, railways and tunnels
- Applicable to the situation where multiple base stations are distributed far away from each other in one direction.

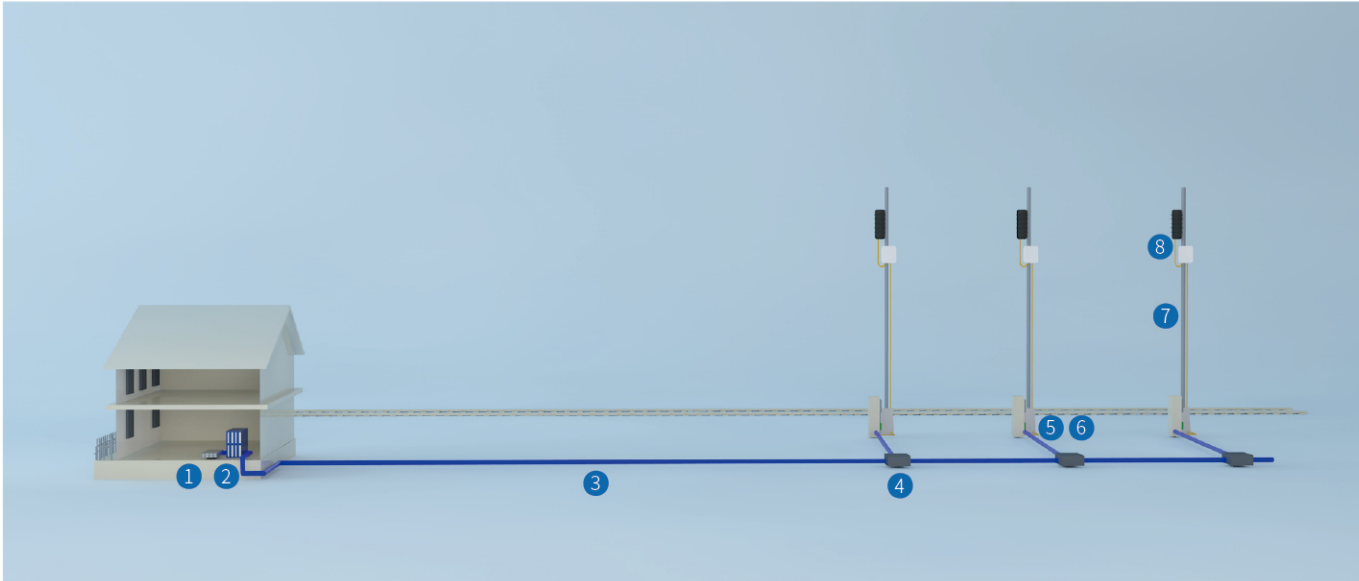
- 1 COT

5 ODB (lightning-proof)
- 2 ODB

6 RT
- 3 Hybrid optical and electrical stranded loose tube cable

7 Hybrid optical and electrical tight buffered patch cord
- 4 Joint box for hybrid cable

8 RF patch cord



S/N	Product	Type	Features
1	Hybrid Cable Applied to Wireless RRU	GDFKJH	Indoor, stainless steel hose armored
		GYDAXZY	Outdoor
		GDFJAH	Indoor
		GDVW/GDHH/GDJH	Indoor
2	Hybrid Cable Applied in Access Network	GDTA	Outdoor, duct or aerial installation
		GDTS	Outdoor, duct or aerial installation
		GDTA53	Outdoor, buried installation

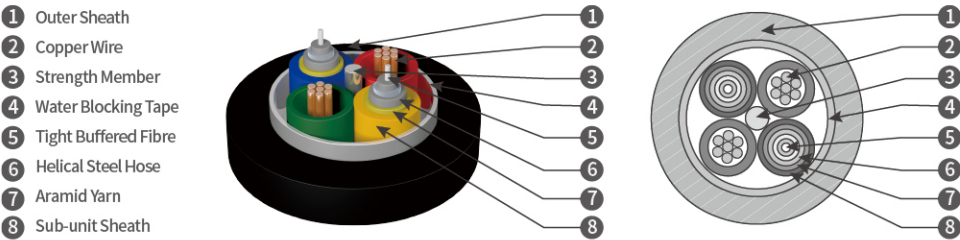
# Hybrid Optical and Electrical Cable (GDFKJH)



Tight buffered fibres are surrounded with a helical steel hose and a layer of aramid yarns as the strength member, and then a LSZH sheath is extruded to form an optical sub-unit. Optical sub-units and copper wires are stranded around a non-metallic central strength member to form a cable core. The core is wrapped with water blocking tape. Finally, a LSZH outer sheath is extruded. Other sheath materials are available on request.

## Features

- Good mechanical and temperature performances
- Stainless steel hose armor providing better protection to fibres
- Good crush resistance and flexibility
- All-dry hybrid structure, supporting bulk data transmission and power supply for RRU devices
- Mainly applied to local fibre remote for short distance at wireless base stations, applicable to the construction of indoor distributed base stations



## Technical Characteristics

Type	Optical unit diameter (mm)	Cable diameter (mm)	Cable weight (Kg/km)	Tensile strength Long/short term (N)	Crush Long/short term (N/100mm)	Bending radius Dynamic/static (mm)
GDFKJH-2Xn+2*1.5	3.0	9.5±0.2	110	400/800	500/1000	20D/10D

Note: Xn refers to fibre type. D is cable diameter. Cross sectional area of copper conductor for this type of optical cable is 1.5mm².

## Environmental Characteristics

- Transport/storage temperature: -20°C ~ +60°C

## Delivery Length

- Standard length: 1,000m; other lengths are also available



# Hybrid Optical and Electrical Cable GYDAXZY (ALL DRY) / 10.5MM<sup>2</sup> X 8C +SMF 24F

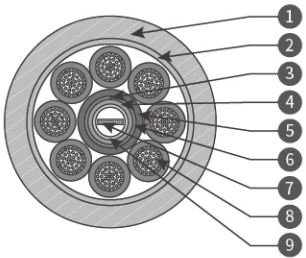
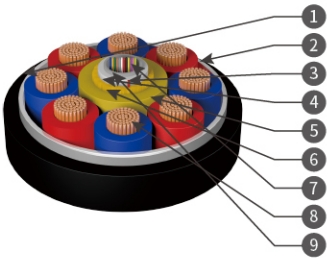


GYDAXZY (ALL DRY) type: The optical-electrical hybrid cable unit is composed of single-mode optical fiber, water and sediment resistance, inner sleeve and outer sleeve, and copper core power cable of the unit to form an internal optoelectronic system. The exterior is composed of welded armor with aluminum tape and extrusion sheath of non-polar flame retardant plastic.

### Features

- The electric -optical integration solves the problems of equipment power consumption and signal transmission, and provides centralized monitoring and maintenance of equipment power supply
- Improve the manageability of power supply and reduce the coordination and maintenance of power supply
- Reduce procurement costs and save construction costs
- Precise control of the excess length of the optical fiber ensures that the cable has good tensile and humidity characteristics
- It is mainly used outdoors to provide power transmission and signal transmission for communication outdoor macro station
- Suitable for pipeline laying

- 1 Hybrid Cable Jacket
- 2 Corrugated Aluminum Tape
- 3 Ripcord
- 4 Loose Tube
- 5 LSZH Sheath
- 6 Aramid Yarn
- 7 Fibre Ribbon
- 8 Insulated Copper Wire
- 9 Water Blocking Tape



### Structure Parameters

Product specification	Cable diameter (mm)	Cable weight (kg/km)	Allowable tensile force Long/short-term (N)	Crush Long/short-term (N)
10.5MM <sup>2</sup> X 8C +SMF 24F	28.5±0.2	1070	1000/3000	1000/3000

### Electrical Properties of Insulating Conductors

Conductor (mm <sup>2</sup> )	Max.conductor resistance at 20°C (Ω/km)	Insulation resistance at 20°C (MΩ·km)	Voltage test (KV, DC 1 minute)	
		Between each insulated wire and other metals connected in the cable	Between conductors	Between conductor and metal armor
10	1.91	≥5000	5	5

Note: 1. Cable conductor performance meets GB/T3956-2008 or IEC60228:2004  
2. Electrical performance of cable meets GB/T5023-3-2007 or IEC60227-1:2007

### Environmental Characteristics

- Transport/storage temperature: -20°C ~ +60°C

### Delivery Length

- Standard length: 1,000m; other lengths are also available.

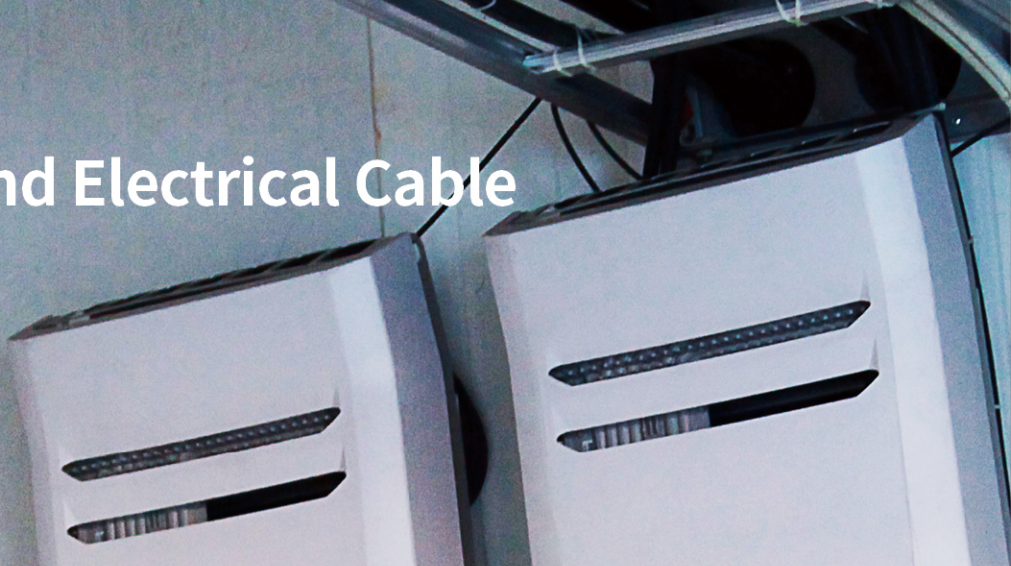
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# Hybrid Optical and Electrical Cable (GDFJAH)



## Technical Characteristics

Type	Type of structure	Cable diameter (mm)	Cable weight (Kg/km)	Tensile strength Long/short term (N)	Crush Long/short term (N/100mm)	Bending radius Dynamic/static (mm)
GDFJAH-2Xn+2*0.75	I	7.5	80	200/400	500/1000	20D/10D
GDFJAH-2Xn+2*1.0	I	8.0	88	200/400	500/1000	20D/10D
GDFJAH-2Xn+2*1.5	I	9.6	105	200/400	500/1000	20D/10D
GDFJAH-2Xn+2*2.0	I	10.3	119	200/400	500/1000	20D/10D
GDFJAH-2Xn+2*4.0	I	11.5	159	200/400	500/1000	20D/10D
GDFJAH-6Xn+2*0.5	II	10.5	110	200/400	500/1000	20D/10D

Note: Xn refers to fibre type, and G.657.A2 fibre is recommended. D is cable diameter. Copper wires with different cross sectional areas are available on request.

## Environmental Characteristics

- Transport/storage temperature: -20°C ~ +60°C

## Delivery Length

- Standard length: 1,000m; other lengths are also available

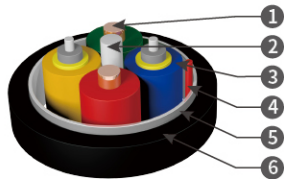


Tight buffered fibres are surrounded with a layer of aramid yarns as the strength member. A LSZH inner sheath is extruded on the tight buffered fibre to form an optical sub-unit. Then optical sub-units and copper wires are stranded around a non-metallic central strength member to form a cable core. The core is armored with laminated aluminum tape. Finally, a LSZH outer sheath is extruded. Other sheath materials are available on request.

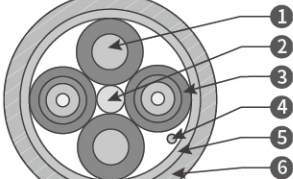
## Features

- Good mechanical and temperature performances
- Excellent crush resistance and flexibility
- All-dry hybrid structure, supporting bulk data transmission and power supply for RRU devices
- Mainly applied to local fibre remote for short distance at wireless base stations, applicable to the construction of indoor distributed base stations

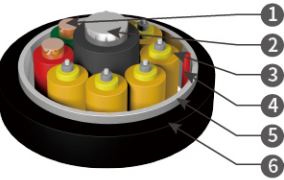
- 1 Copper Wire
- 2 Strength Member
- 3 Optical Sub-unit
- 4 Ripcord
- 5 APL
- 6 LSZH Sheath



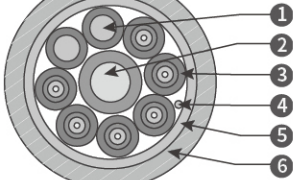
Structure I



- 1 Copper Wire
- 2 Strength Member
- 3 Optical Sub-unit
- 4 Ripcord
- 5 APL
- 6 LSZH Sheath



Structure II



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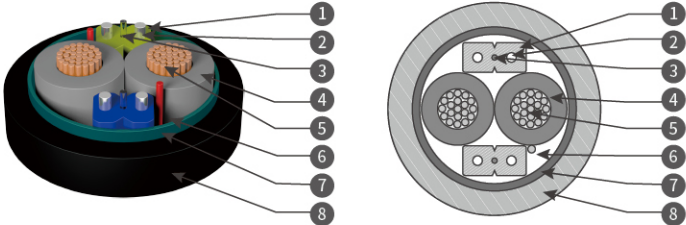
# Hybrid Cable Applied to RRU (GDVV/GDHH/GDJH)

GDVV/GDHH/GDJH type: The structure of hybrid cable is composed of single-mode optical fiber, steel wire, low smoke halogen-free polyolefin extruded cable, and copper core power cable. Finally, a LSZH outer sheath is extruded. Other sheath materials are available on request.

### Features

- The electric -optical integration solves the problems of equipment power consumption and signal transmission, and provides centralized monitoring and maintenance of equipment power supply
- Improve the manageability of power supply and reduce the coordination and maintenance of power supply
- Reduce procurement costs and save construction costs
- Precise control of fiber length ensures that the cable has good tensile and humidity characteristics
- Mainly used for indoor, to provide power transmission and signal transmission for indoor distribution base stations
- Suitable for pipeline laying

- 1 Simplex Bow-type Optical Cable
- 2 Strength Member
- 3 Optical Fibre
- 4 Insulation
- 5 Conductor
- 6 Filler
- 7 Wrapping Tape
- 8 Outer Sheath



### Structure Parameters

Product specification	Cable diameter (mm)	Cable weight (kg/km)	Allowable tensile force Long/short-term (N)	Crush Long/short-term (N)
GDVV/GDHH/GDJH-G.657A2(Bow-type )2*1.5mm <sup>2</sup>	9±0.2	95.3	600/1500	300/1000
GDVV/GDHH/GDJH-G.657A2(Bow-type )2*2.5mm <sup>2</sup>	10±0.2	125	600/1500	300/1000
GDVV/GDHH/GDJH-G.657A2(Bow-type )2*4mm <sup>2</sup>	11±0.2	153	600/1500	300/1000
GDVV/GDHH/GDJH-G.657A2(Bow-type )2*6mm <sup>2</sup>	12.2±0.2	200	600/1500	300/1000

### Electrical Properties of Insulating Conductors

Conductor (mm <sup>2</sup> )	Max.conductor resistance at 20°C (Ω/km)	Insulation resistance at 20°C (MΩ·km)	Voltage test (KV, DC 1 minute)
		Between each insulated wire and other metals connected in the cable	Between conductors
1.5	13.3	≥5000	5
2.5	7.98		
4	4.95		
6	3.30		

Note: 1. Cable conductor performance meets GB/T3956-2008 or IEC60228:2004  
2. Electrical performance of cable meets GB/T5023-3-2007 or IEC60227-1:2007

### Environmental Characteristics

- Transport/storage temperature: -20°C ~ +60°C

### Delivery Length

- Standard length: 1,000m; other lengths are also available

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# Hybrid Optical and Electrical Stranded Loose Tube Cable (GDTA)



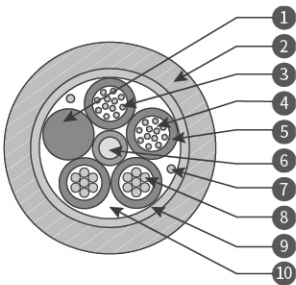
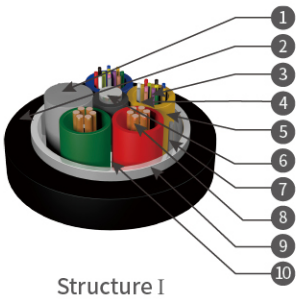
Single-mode/multimode fibres are housed in loose tubes that are made of high-modulus plastic and filled with tube filling compound. In the center of cable is a metallic strength member. The tubes and copper wires (of required specifications) are stranded around the central strength member to form a cable core. The core is filled with cable filling compound and armored with laminated aluminum tape. Then, a PE sheath is extruded.

### Features

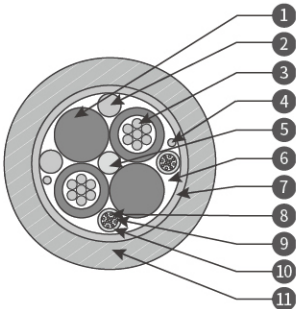
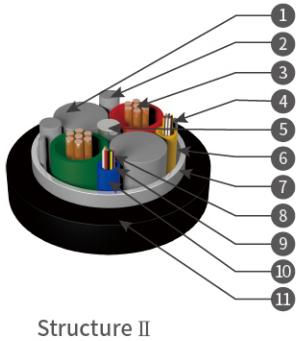
- Accurate process control ensuring good mechanical and temperature performances
- Optical and electrical hybrid design, solving the problem of power supply and signal transmission and providing the centralized monitoring and maintenance of power for equipment
- Improving manageability of power and reducing coordination and maintenance of power supply
- Reducing procurement costs and saving construction costs
- Mainly used to connect BBU and RRU in DC remote power supply system for distributed base station
- Applicable to duct and aerial installations



- 1 Filler
- 2 PE Sheath
- 3 Fibre
- 4 Tube Filling Compound
- 5 Loose Tube
- 6 Strength Member
- 7 Ripcord
- 8 Copper Wire
- 9 APL
- 10 Cable Filling Compound



- 1 Filler
- 2 Filler
- 3 Copper Wire
- 4 Ripcord
- 5 Strength Member
- 6 Cable Filling Compound
- 7 APL
- 8 Fibre
- 9 Tube Filling Compound
- 10 Loose Tube
- 11 PE Sheath



### Technical Characteristics

Type	O.D. (mm)	Weight (Kg/km)	Tensile strength Long/short term (N)	Crush Long/short term (N/100mm)	Structure
GDTA-02~24Xn+2×1.5	11.2	132	600/1500	300/1000	Structure I
GDTA-02~24Xn+2×2.5	12.3	164	600/1500	300/1000	Structure I
GDTA-02~24Xn+2×4.0	14.4	212	600/1500	300/1000	Structure II
GDTA-02~24Xn+2×5.0	14.6	258	600/1500	300/1000	Structure II
GDTA-02~24Xn+2×6.0	15.4	287	600/1500	300/1000	Structure II
GDTA-02~24Xn+2×8.0	16.5	350	600/1500	300/1000	Structure II

Note: 1. Xn refers to fibre type.  
2. 2\*1.5/2\*2.5/2\*4.0/2\*6.0/2\*8.0 indicates the number and size of copper wires.  
3. Hybrid cables with different numbers and sizes of copper wires can be provided on request.  
4. Hybrid cables with different fibre counts can be provided on request.

### Electrical Performance of Conductor

Cross section (mm²)	Max. DC resistance of single conductor (20 °C)(Ω/km)	Insulation resistance (20°C)(MΩ.km)	Dielectric strength KV, DC 1min		
		Between each conductor and other metal members connected in cable	Between conductors	Between conductor and metallic armor	Between conductor and steel wire
1.5	13.3	No less than 5,000	5	5	3
2.5	7.98				
4.0	4.95				
5.0	3.88				
6.0	3.30				
8.0	2.47				

### Environmental Characteristics

- Transport/storage temperature: -20°C ~ +60°C

### Delivery Length

- Standard length: 1,000m; other lengths are also available



# Hybrid Optical and Electrical Stranded Loose Tube Cable (GDTS)



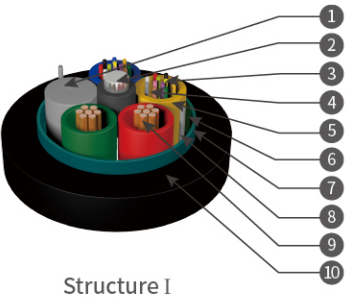
Single-mode/multimode fibres are housed in loose tubes that are made of high-modulus plastic and filled with tube filling compound. In the center of cable is a metallic strength member. The tubes and copper wires (of required specifications) are stranded around the central strength member to form a cable core. The core is filled with cable filling compound and armored with corrugated steel tape. Then, a PE sheath is extruded.

### Features

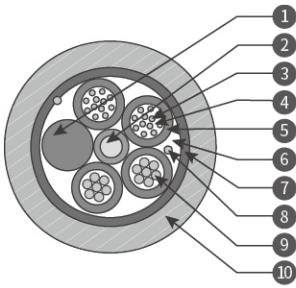
- Accurate process control ensuring good mechanical and temperature performances
- Optical and electrical hybrid design, solving the problem of power supply and signal transmission and providing the centralized monitoring and maintenance of power for equipment
- Improving manageability of power and reducing coordination and maintenance of power supply
- Reducing procurement costs and saving construction costs
- Mainly used to connect BBU and RRU in DC remote power supply system for distributed base station
- Applicable to duct and aerial installations



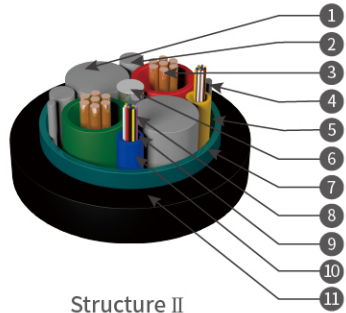
- 1 Filler
- 2 Strength Member
- 3 Fibre
- 4 Tube Filling Compound
- 5 Loose Tube
- 6 Cable Filling Compound
- 7 PSP
- 8 Ripcord
- 9 Copper Wire
- 10 PE Sheath



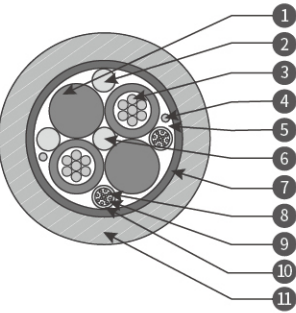
Structure I



- 1 Filler
- 2 Filler
- 3 Copper Wire
- 4 Ripcord
- 5 Cable Filling Compound
- 6 Strength Member
- 7 PSP
- 8 Fibre
- 9 Tube Filling Compound
- 10 Loose Tube
- 11 PE Sheath



Structure II



### Technical Characteristics

Type	O.D. (mm)	Weight (Kg/km)	Tensile strength Long/short term (N)	Crush Long/short term (N/100mm)	Structure
GDTS-02~24Xn+2×1.5	11.6	157	600/1500	300/1000	Structure I
GDTS-02~24Xn+2×2.5	12.5	190	600/1500	300/1000	Structure I
GDTS-02~24Xn+2×4.0	14.6	241	600/1500	300/1000	Structure II
GDTS-02~24Xn+2×5.0	15.0	282	600/1500	300/1000	Structure II
GDTS-02~24Xn+2×6.0	15.7	300	600/1500	300/1000	Structure II
GDTS-02~24Xn+2×8.0	16.9	383	600/1500	300/1000	Structure II

Note: 1. Xn refers to fibre type.  
2. 2\*1.5/2\*2.5/2\*4.0/2\*6.0/2\*8.0 indicates the number and size of copper wires.  
3. Hybrid cables with different numbers and sizes of copper wires can be provided on request.  
4. Hybrid cables with different fibre counts can be provided on request.

### Electrical Performance of Conductor

Cross section (mm²)	Max. DC resistance of single conductor (20 °C)(Ω/km)	Insulation resistance (20°C)(MΩ.km)	Dielectric strength KV, DC 1min		
		Between each conductor and other metal members connected in cable	Between conductors	Between conductor and metallic armor	Between conductor and steel wire
1.5	13.3	No less than 5,000	5	5	3
2.5	7.98				
4.0	4.95				
5.0	3.88				
6.0	3.30				
8.0	2.47				

### Environmental Characteristics

- Transport/storage temperature: -20°C ~ +60°C

### Delivery Length

- Standard length: 1,000m; other lengths are also available



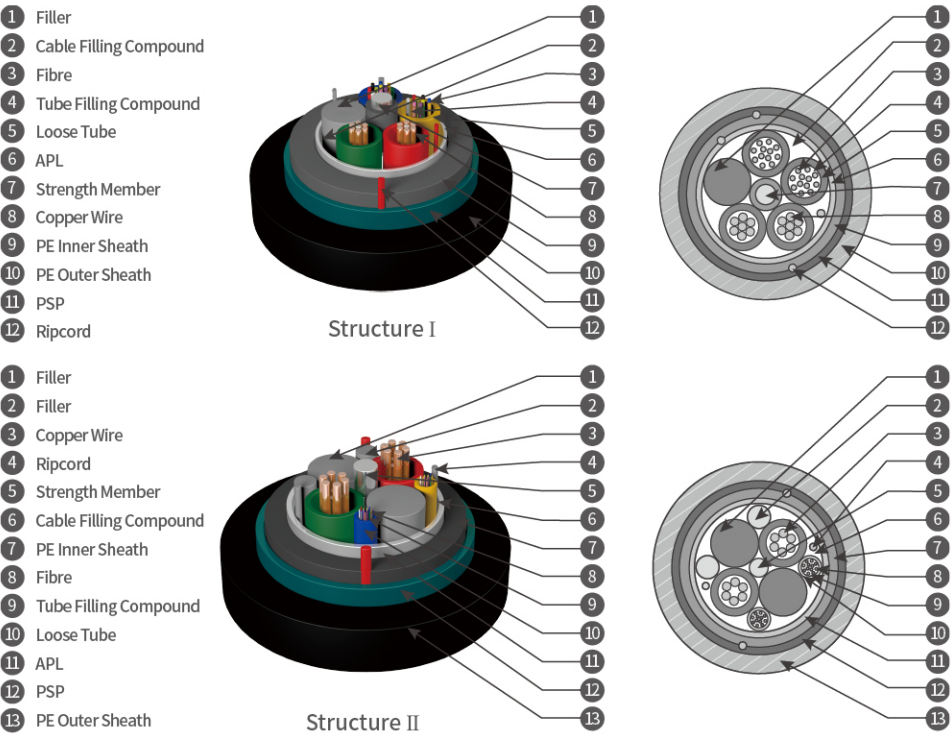
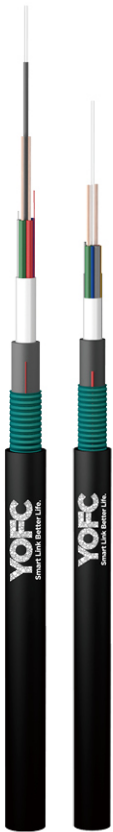
# Hybrid Optical and Electrical Stranded Loose Tube Cable (GDTA53)



Single-mode/multimode fibres are housed in loose tubes that are made of high-modulus plastic and filled with tube filling compound. In the center of cable is a metallic strength member. The tubes and copper wires (of required specifications) are stranded around the central strength member to form a cable core. The core is filled with cable filling compound and armored with laminated aluminum tape. Then an PE inner sheath is extruded and armored with corrugated steel tape. Finally, a PE outer sheath is extruded.

### Features

- Accurate process control ensuring good mechanical and temperature performances
- Optical and electrical hybrid design, solving the problem of power supply and signal transmission and providing the centralized monitoring and maintenance of power for equipment
- Improving manageability of power and reducing coordination and maintenance of power supply
- Reducing procurement costs and saving construction costs
- Mainly used to connect BBU and RRU in DC remote power supply system for distributed base station
- Applicable to buried installation



### Technical Characteristics

Type	O.D. (mm)	Weight (Kg/km)	Tensile strength Long/short term (N)	Crush Long/short term (N/100mm)	Structure
GDTA53-02~24Xn+2*1.5	15.1	290	1000/3000	1000/3000	Structure I
GDTA53-02~24Xn+2*2.5	15.5	312	1000/3000	1000/3000	Structure I
GDTA53-02~24Xn+2*4.0	18.2	358	1000/3000	1000/3000	Structure II
GDTA53-02~24Xn+2*5.0	18.6	390	1000/3000	1000/3000	Structure II
GDTA53-02~24Xn+2*6.0	19.9	435	1000/3000	1000/3000	Structure II
GDTA53-02~24Xn+2*8.0	20.8	478	1000/3000	1000/3000	Structure II

Note: 1. Xn refers to fibre type.  
2. 2\*1.5/2\*2.5/2\*4.0/2\*6.0/2\*8.0 indicates the number and size of copper wires.  
3. Hybrid cables with different numbers and sizes of copper wires can be provided on request.  
4. Hybrid cables with different fibre counts can be provided on request.

### Electrical Performance of Conductor

Cross section (mm <sup>2</sup> )	Max. DC resistance of single conductor (20 °C)(Ω/km)	Insulation resistance (20°C)(MΩ.km)	Dielectric strength KV, DC 1min		
		Between each conductor and other metal members connected in cable	Between conductors	Between conductor and metallic armor	Between conductor and steel wire
1.5	13.3	No less than 5,000	5	5	3
2.5	7.98				
4.0	4.95				
5.0	3.88				
6.0	3.30				
8.0	2.47				

### Environmental Characteristics

- Transport/storage temperature: -20°C ~ +60°C

### Delivery Length

- Standard length: 1,000m; other lengths are also available.