

TECHNICAL SPECIFICATION

Duct Optical Fiber Cable

Type 2



1. General

1.1 Scope

This listed specification covers the design requirements and performance standard for the supply of optical fiber cable in the industry. It also includes ZTT premium designed cable with optical, mechanical and geometrical characteristics.

Cable type	Application
OFC-x G.652D-DiC-S1	Duct installation cable

1.2 Cable Description

ZTT cable possesses high tensile strength and flexibility in compact cable sizes. At the same time, it provides excellent optical transmission and physical performance.

1.3 Quality

Excellent quality control is achieved through intense in-house quality check and stringent audit acceptance by ISO 9001.

1.4 Reliability

Initial and periodic product qualification tests for performance and durability are performed rigorously to ensure product reliability.

1.5 Reference

The cable which ZTT offered are designed, manufactured and tested according to international standards as follows:

IEC 60793-1	Optical fiber Part 1: Generic specifications
IEC 60793-2	Optical fiber Part 2: Product specifications
IEC 60794-3-10	Optical fiber cables- Part 3-10: outdoor cables-family specification for duct and directly buried optical telecommunication cables
ITU-T G.650	Definition and test methods for the relevant parameters of single-mode fibers
ITU-T G.652	Characteristics of a single-mode optical fiber and cable

2. Optical Fiber

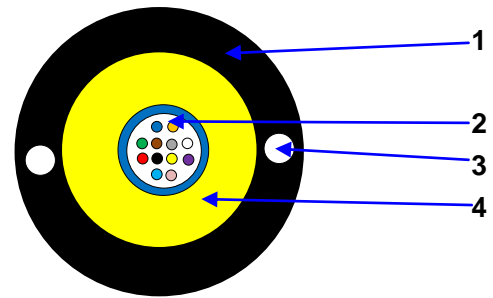
The optical fiber is made of high pure silica and germanium doped silica. UV curable acrylate material is applied over fiber cladding as optical fiber primary protective coating. The detail data of optical fiber performance are shown in the following table.

G.652D Fiber

Category	Description	Specifications	
		Before cabling	After cabling
Optical Specifications	Attenuation @ 1310 nm	≤0.34 dB/km	≤0.36 dB/km
	Attenuation @ 1383 nm	≤0.34 dB/km	≤0.36 dB/km
	Attenuation @ 1550 nm	≤0.20 dB/km	≤0.22 dB/km
	Zero Dispersion Wavelength	1300~1324 nm	
	Zero Dispersion Slope	≤0.092 ps/nm ² ·km	
	Chromatic dispersion at 1285~1330nm	≤3.5 ps/nm·km	
	Chromatic dispersion at 1550nm	≤18.0 ps/nm·km	
	PMD Max. Value	0.2 ps/√km	
	Cable Cutoff Wavelength (λ_{cc})	1150~1330 nm	
	Macro bending Loss (100 turns; Φ 50 mm) @1550 nm	≤ 0.05 dB	
	(100 turns; Φ 50 mm) @1625 nm	≤ 0.10 dB	
Mode Field Diameter @1310 nm	9.3±0.5 μ m		
Dimensional Specifications	Cladding Diameter	125 ±2 μ m	
	Core/clad concentricity error	≤0.6 μ m	
	Cladding Non-Circularity	≤2.0%	
	Coating diameter (uncolored)	245 ±10 μ m	
Mechanical Specifications	Proof stress	≥8N (1%,1s)	
	Coating strip force	1~5N	

3. CABLE STRUCTURE

3.1 Cable Type: OFC-12 G.652D-DiC-S1 (TO SM d 03 1x12 SMAN)



The picture is only for reference

Technical Characteristics

- With excellent mechanical and environmental properties
- Low weight, easy to install and joint

Construction:

1. Outer sheath (PE)
2. Gel-filled micro module
3. FRP*2
4. Aramid yarns with water blocking yarn

Dimension and Properties

Physical	Fiber count	12 G.652D
	No. of micro module	1
	Fiber No. per module	12
	Outer sheath thickness	Min 2.0mm
	Cable OD	7.0±0.5mm
	Cable weight	34kg/km ± 15%
	Operation temperature range	-20 deg C to + 60 deg C
	Installation temperature range	-10 deg C to + 50 deg C
	Transport and storage temperature range	-20 deg C to + 60 deg C
Mechanical	Max. tensile load	15N x W (W= cable weight in kg/km) 510N
	Crush resistance	2500 N/100mm
	Minimal installation bending radius	20 x OD
	Minimal operation bending radius	10 x OD

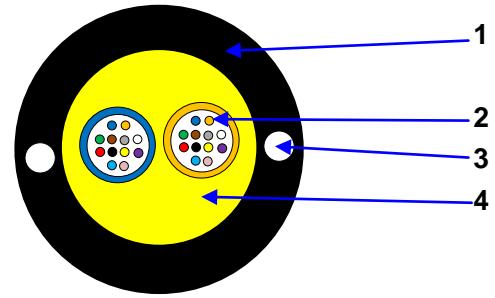
Color code scheme:

Fiber color	blue	orange	green	brown	gray	white	red	black	yellow	violet	pink	aqua
Tube color	blue	/	/	/	/	/	/	/	/	/	/	/

3.2 Cable Type: OFC-24 G.652D-DiC-S1 (TO SM d 03 2x12 SMAN)



The picture is only for reference



Construction:

1. Outer sheath (PE)
2. Gel-filled micro module
3. FRP*2
4. Aramid yarns with water blocking yarn

Technical Characteristics

- With excellent mechanical and environmental properties
- Low weight, easy to install and joint

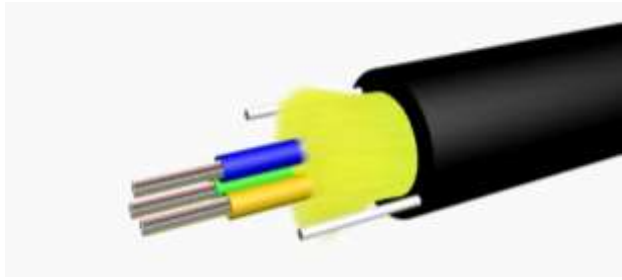
Dimension and Properties

Physical	Fiber count	24 G.652D
	No. of micro module	2
	Fiber No. per module	12
	Outer sheath thickness	Min 2.0mm
	Cable OD	8.0±0.5mm
	Cable weight	42kg/km ± 15%
	Operation temperature range	-20 deg C to + 60 deg C
	Installation temperature range	-10 deg C to + 50 deg C
	Transport and storage temperature range	-20 deg C to + 60 deg C
Mechanical	Max. tensile load	15N x W (W= cable weight in kg/km) 630N
	Crush resistance	2500 N/100mm
	Minimal installation bending radius	20 x OD
	Minimal operation bending radius	10 x OD

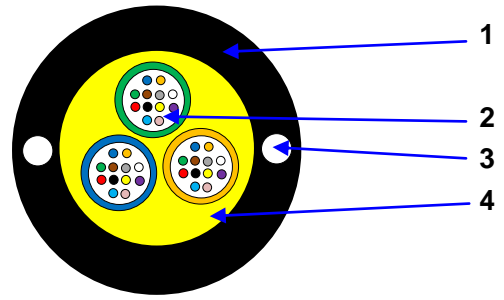
Color code scheme:

Fiber color	blue	orange	green	brown	gray	white	red	black	yellow	violet	pink	aqua
Tube color	blue	orange	/	/	/	/	/	/	/	/	/	/

3.3 Cable Type: OFC-36 G.652D-DiC-S1 (TO SM d 03 3x12 SMAN)



The picture is only for reference



Construction:

1. Outer sheath (PE)
2. Gel-filled micro module
3. FRP*2
4. Aramid yarns with water blocking yarn

Technical Characteristics

- With excellent mechanical and environmental properties
- Low weight, easy to install and joint

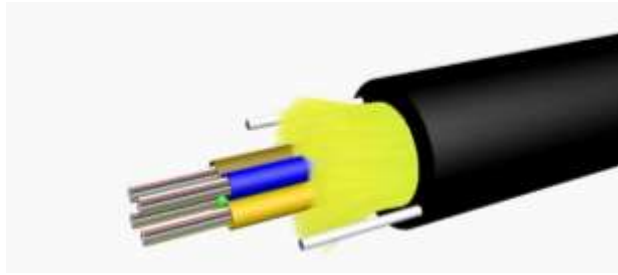
Dimension and Properties

Physical	Fiber count	36 G.652D
	No. of micro module	3
	Fiber No. per module	12
	Outer sheath thickness	Min 2.0mm
	Cable OD	8.5±0.5mm
	Cable weight	48kg/km±15%
	Operation temperature range	-20 deg C to + 60 deg C
	Installation temperature range	-10 deg C to + 50 deg C
	Transport and storage temperature range	-20 deg C to + 60 deg C
Mechanical	Max. tensile load	15N x W (W= cable weight in kg/km) 720N
	Crush resistance	2500 N/100mm
	Minimal installation bending radius	20 x OD
	Minimal operation bending radius	10 x OD

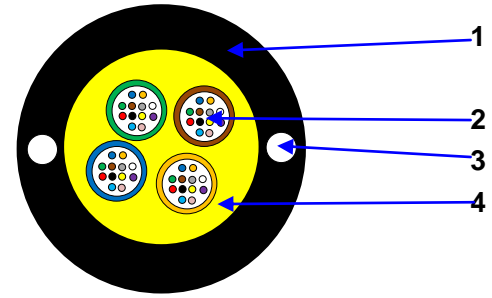
Color code scheme:

Fiber color	blue	orange	green	brown	gray	white	red	black	yellow	violet	pink	aqua
Tube color	blue	orange	green	/	/	/	/	/	/	/	/	/

3.4 Cable Type: OFC-48 G.652D-DiC-S1 (TO SM d 03 4x12 SMAN)



The picture is only for reference



Construction:

1. Outer sheath (PE)
2. Gel-filled micro module
3. FRP*2
4. Aramid yarns with water blocking yarn

Technical Characteristics

- With excellent mechanical and environmental properties
- Low weight, easy to install and joint

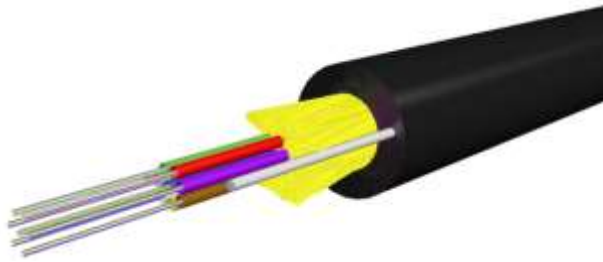
Dimension and Properties

Physical	Fiber count	48 G.652D
	No. of micro module	4
	Fiber No. per module	12
	Outer sheath thickness	Min 2.0mm
	Cable OD	9.0±0.5mm
	Cable weight	54kg/km±15%
	Operation temperature range	-20 deg C to + 60 deg C
	Installation temperature range	-10 deg C to + 50 deg C
	Transport and storage temperature range	-20 deg C to + 60 deg C
Mechanical	Max. tensile load	15N x W (W= cable weight in kg/km) 810N
	Crush resistance	2500 N/100mm
	Minimal installation bending radius	20 x OD
	Minimal operation bending radius	10 x OD

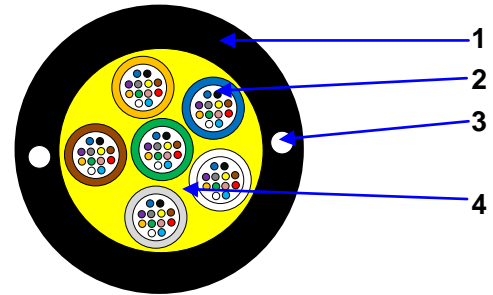
Color code scheme:

Fiber color	blue	orange	green	brown	gray	white	red	black	yellow	violet	pink	aqua
Tube color	blue	orange	green	brown	/	/	/	/	/	/	/	/

3.5 Cable Type: OFC-72 G.652D-DiC-S1 (TO SM d 03 6x12 SMAN)



The picture is only for reference



Construction:

Technical Characteristics

- With excellent mechanical and environmental properties
- Low weight, easy to install and joint

1. Outer sheath (PE)
2. Gel-filled micro module
3. FRP*2
4. Aramid yarns with water blocking yarn

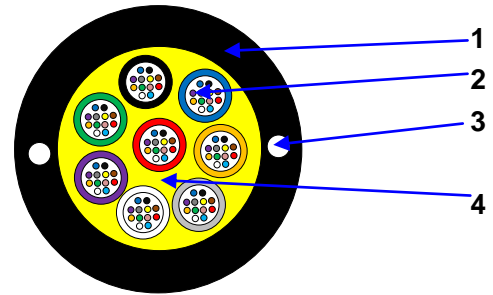
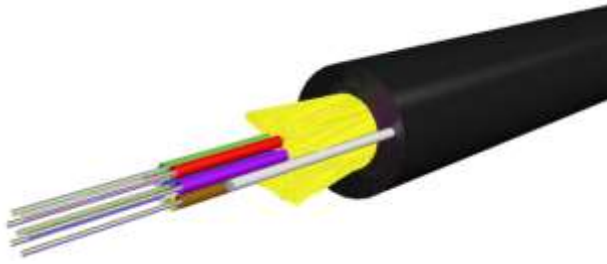
Dimension and Properties

Physical	Fiber count	72 G.652D
	No. of micro module	6
	Fiber No. per module	12
	Outer sheath thickness	Min 2.0mm
	Cable OD	9.8 mm ± 5%
	Cable weight	62kg/km ± 15%
	Operation temperature range	-20 deg C to + 60 deg C
	Installation temperature range	-10 deg C to + 50 deg C
	Transport and storage temperature range	-20 deg C to + 60 deg C
Mechanical	Max. tensile load	15N x W (W= cable weight in kg/km) 930N
	Crush resistance	2500 N/100mm
	Minimal installation bending radius	20 x OD
	Minimal operation bending radius	10 x OD

Color code scheme:

Fiber color	blue	orange	green	brown	gray	white	red	black	yellow	violet	pink	aqua
Tube color	blue	orange	green	brown	gray	white	/	/	/	/	/	/

3.6 Cable Type: OFC-96 G.652D-DiC-S1 (TO SM d 03 8x12 SMAN)



The picture is only for reference

Technical Characteristics

- With excellent mechanical and environmental properties
- Low weight, easy to install and joint

Construction:

1. Outer sheath (PE)
2. Gel-filled micro module
3. FRP*2
4. Aramid yarns with water blocking yarn

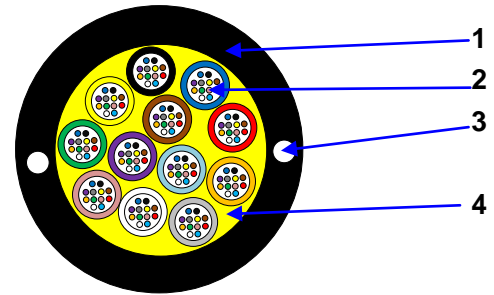
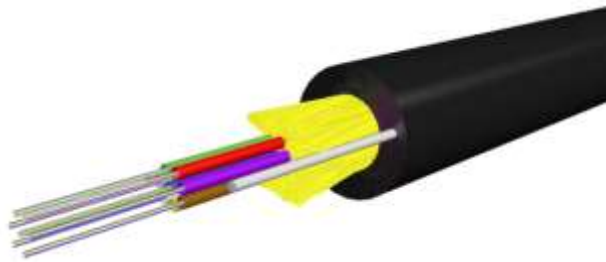
Dimension and Properties

Physical	Fiber count	96 G.652D
	No. of micro module	8
	Fiber No. per module	12
	Outer sheath thickness	Min 2.0mm
	Cable OD	10.5mm ± 5%
	Cable weight	72kg/km ± 15%
	Operation temperature range	-20 deg C to + 60 deg C
	Installation temperature range	-10 deg C to + 50 deg C
	Transport and storage temperature range	-20 deg C to + 60 deg C
Mechanical	Max. tensile load	15N x W (W= cable weight in kg/km) 1080N
	Crush resistance	2500 N/100mm
	Minimal installation bending radius	20 x OD
	Minimal operation bending radius	10 x OD

Color code scheme:

Fiber color	blue	orange	green	brown	gray	white	red	black	yellow	violet	pink	aqua
Tube color	blue	orange	green	brown	gray	white	red	black	/	/	/	/

3.7 Cable Type: OFC-144 G.652D-DiC-S1 (TO SM d 03 12x12 SMAN)



The picture is only for reference

Technical Characteristics

- With excellent mechanical and environmental properties
- Low weight, easy to install and joint

Construction:

1. Outer sheath (PE)
2. Gel-filled micro module
3. FRP*2
4. Aramid yarns with water blocking yarn

Dimension and Properties

Physical	Fiber count	144 G.652D
	No. of micro module	12
	Fiber No. per module	12
	Outer sheath thickness	Min 2.0mm
	Cable OD	11.7 mm ± 5%
	Cable weight	88kg/km ± 15%
	Operation temperature range	-20 deg C to + 60 deg C
	Installation temperature range	-10 deg C to + 50 deg C
	Transport and storage temperature range	-20 deg C to + 60 deg C
Mechanical	Max. tensile load	15N x W (W= cable weight in kg/km) 1320N
	Crush resistance	2500 N/100mm
	Minimal installation bending radius	20 x OD
	Minimal operation bending radius	10 x OD

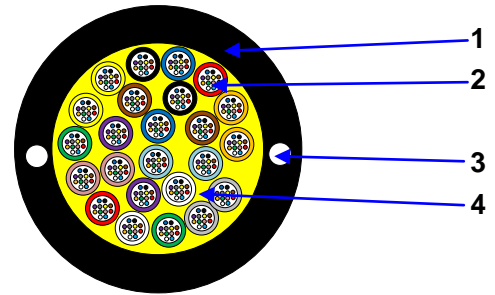
Color code scheme:

Fiber color	blue	orange	green	brown	gray	white	red	black	yellow	violet	pink	aqua
Tube color	blue	orange	green	brown	gray	white	red	black	yellow	violet	pink	aqua

3.8 Cable Type: OFC-288 G.652D-DiC-S1 (TO SM d 03 24x12 SMAN)



The picture is only for reference



Construction:

1. Outer sheath (PE)
2. Gel-filled micro module
3. FRP*2
4. Aramid yarns with water blocking yarn

Technical Characteristics

- With excellent mechanical and environmental properties
- Low weight, easy to install and joint

Dimension and Properties

Physical	Fiber count	288 G.652D
	No. of micro module	24
	Fiber No. per module	12
	Outer sheath thickness	Min 2.0mm
	Cable OD	14.4mm ± 5%
	Cable weight	134kg/km ± 15%
	Operation temperature range	-20 deg C to + 60 deg C
	Installation temperature range	-10 deg C to + 50 deg C
	Transport and storage temperature range	-20 deg C to + 60 deg C
Mechanical	Max. tensile load	15N x W (W= cable weight in kg/km) 2010N
	Crush resistance	2500 N/100mm
	Minimal installation bending radius	20 x OD
	Minimal operation bending radius	10 x OD

Color code scheme:

Fiber color	blue	orange	green	brown	gray	white	red	black	yellow	violet	pink	aqua
Tube color	blue	orange	green	brown	gray	white	red	black	yellow	violet	pink	aqua

13~24 module color: blue, orange, green, brown, gray, white, red, black, yellow, violet, pink, aqua, black module with white track, other modules with black track.

4. Test Requirements

Approved by various professional optical and communication product institution, ZTT also conduct various in-house testing in its own Laboratory and Test Center. ZTT also conduct test with special arrangement with the Chinese Government Ministry of Quality Supervision & Inspection Center of Optical Communication Products (QSICO). ZTT possess the technology to keep its fiber attenuation loss within Industry Standards.

The cable is in accordance with applicable standard of cable and requirement of customer. The following test items are carried out according to corresponding reference.

Routine tests of optical fiber

Mode field diameter	IEC 60793-1-45
Mode field Core/clad concentricity	IEC 60793-1-20
Cladding diameter	IEC 60793-1-20
Cladding non-circularity	IEC 60793-1-20
Attenuation coefficient	IEC 60793-1-40
Chromatic dispersion	IEC 60793-1-42
Cable cut-off wavelength	IEC 60793-1-44

Test lists

4.1 Tension Loading Test

Test Standard	IEC 60794-1-2 E1
Sample length	No less than 50 meters
Load	Max. tension load
Duration time	1 minute
Test results	Fiber strain: $\leq 0.60\%$
	Additional attenuation: $\leq 0.1\text{dB}$
	No damage to outer jacket and inner elements

4.2 Crush/Compression Test

Test Standard	IEC 60794-1-2 E3
Load	Crush load
Duration time	1minute
Test number	3
Test results	After test, Additional attenuation: $\leq 0.05\text{dB}$
	No damage to outer jacket and inner elements

4.3 Impact Resistance Test

Test Standard	IEC 60794-1-2 E4
Impact energy	10J
Radius	300mm
Impact points	3
Impact number	1
Test result	No attenuation change ($\leq 0.05\text{dB}$)
	No damage to outer jacket and inner elements

4.4 Repeated Bending Test

Test Standard	IEC 60794-1-2 E6
Bending radius	20 X diameter of cable
Cycles	35 cycles
Load	30N
Test result	No attenuation change ($\leq 0.05\text{dB}$)
	No damage to outer jacket and inner elements

4.5 Torsion/Twist Test

Test Standard	IEC 60794-1-2 E7
Sample length	1m
Angles	±180 degree
cycles	5
Load	200N
Test result	Additional attenuation:≤0.1dB
	No damage to outer jacket and inner elements

4.6 Low Temperature Cable Bend

Test Standard	IEC 60794-1-2 E11A
Temperature	-10℃
Mandrel diameter	20D
Turn number	5
Number of cycles	3
Test result	No attenuation change (≤0.05dB)
	No damage to outer jacket and inner elements

4.7 Temperature cycling Test

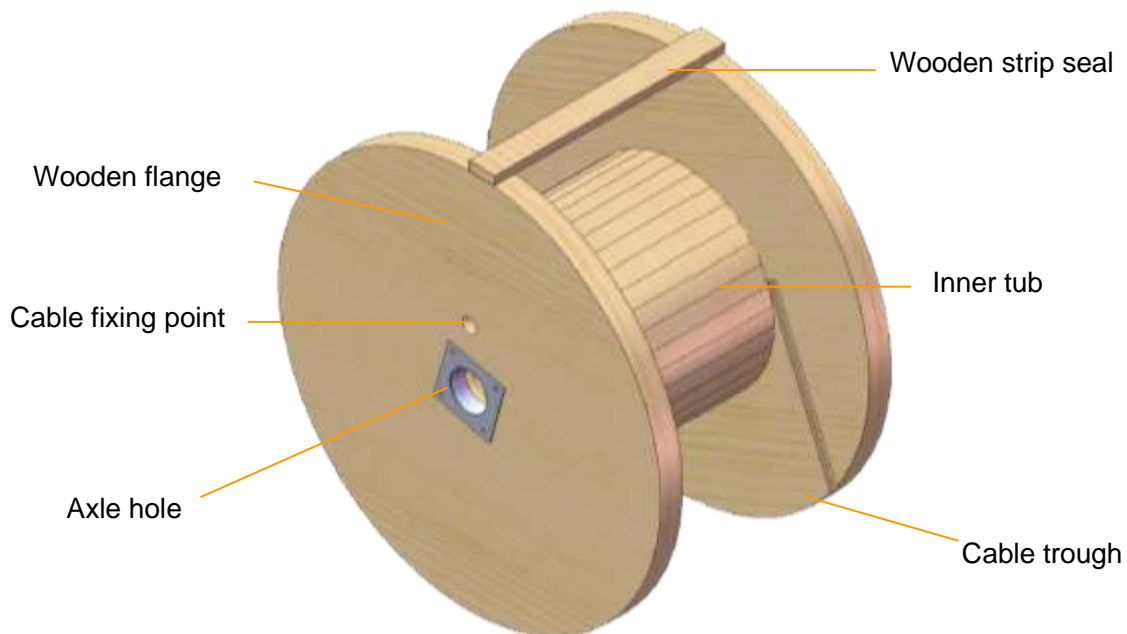
Test Standard	IEC 60794-1-2 F1
Temperature step	+20℃ →-20℃ →+60℃
Time per each step	12 hrs
Cycles	2
Test result	Attenuation variation for reference value (the attenuation to be measured before test at +20±3℃) ≤ 0.10 dB/km

4.8 Water penetration Test

Test Standard	IEC 60794-1-2 F5
Height of water column	1m
Sample length	3m
Test time	24 hrs
Test result	No water leakage from the opposite of the sample

5. Packing and Drum

5.1 ZTT cables are packed in carton, coiled on Bakelite & wooden drum. During transportation, right tools should be used to avoid damaging the package and to handle with ease. Cables should be protected from moisture; kept away from high temperature and fire sparks; protected from over bending and crushing; protected from mechanical stress and damage.



5.2 The color of cable marking is white. (The printing shall be carried out at interval of 1 meter on the outer sheath of cable) The inner end of cable is then sealed with heat shrinkable end cap to prevent ingress of water and is made available for testing. The outer end of cable is equipped with heat shrinkable end cap. Outer sheath marking legend can be changed according to user's requests.

5.3 Outdoor cable packing

Bakelite & wooden drum

Strong wooden batten protection