

## FIBER OPTIC CABLE

### ADSS FIBER OPTIC DOUBLE JACKET FRP

This specification covers design requirements and performance standards for procurement of fiber optic cables in the fiber industry. TSP brand guarantees a stable quality control system for us from the factory. Cable products pass several programs including ISO 9001, ISO 14001 and ROHS.

#### // PRODUCT DESCRIPTION

- Single Mode (9/125  $\mu\text{m}$ )
- The cable shall be used for aerial or duct installed.
- Provide additional mechanical protection.
- low friction installation.
- Excellent protection from environmental hazards.
- Color code fiber and Loose tube in standard.

#### // APPLICATION

- Ethernet LAN Network, CCTV Camera , ETC
- Optical fibre cables supplied in compliance with this specifications is capable to withstand the typical service condition for a period of 30 years without detriment to the operation characteristics of the cable.
- Outdoor environment with high electric field strength in the Power communication system and the area where frequent thunder happens suitable for both aerial or duct installation.

#### // STANDARD

- ATM, FDDI, FTTX, Fiber Channel, CATV, Communication
- ISO/IEC 11801:2007, ISO/IEC 11801:2011 (Ed.2.2)
- ANSI/TIA/EIA-568-B.3, ANSI/TIA-568-C.3, ANSI/TIA-568.3-D, ANSI/ICEA 640
- Telcordia (Bellcore) GR-20 CORE, GR-409-CORE
- ANSI/ICEA 596, ICEA 696, IEC 61034-2, IEC 60754-2, IEC 60793, IEC 60794-1-2, EN 50173
- ITU-T G.652D, ITU-T G.657A2
- TIA/EIA-598-C (Rev. TIA/EIA-598-A), EIA-359-A.
- IEEE 802.3z, IEEE 802.3ae, IEEE 802.3 (LAN, Ethernet Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet 40-100 Gbps)
- RoHS Compliant
- TIS 2166-2548
- GB/T 12706-2008 Standard



## // CONSTRUCTION CABLE

| Cable type              |                              | ADSS                                                                                          |
|-------------------------|------------------------------|-----------------------------------------------------------------------------------------------|
| Element                 | -                            | 5                                                                                             |
| Fiber Optic             | Material                     | Silica High Grade / Compound Glass                                                            |
| Central strength member | Material                     | FRP 1.8 ± 0.2 mm                                                                              |
| Loose tube              | Material                     | PBT                                                                                           |
|                         | Outer Diameter               | 2.0 ± 0.2 mm                                                                                  |
|                         | Inner Diameter               | 1.5 ± 0.2 mm                                                                                  |
|                         | -                            | 6 fiber per tube, Thixotropic Jelly Compound                                                  |
| Protective tape         | Material                     | Water -blocking tape : 0.3mm, Water blocking yarn : 0.3mm                                     |
| Strength member         | Material                     | Aramid yarns                                                                                  |
| Rodent Protection Armor | Material                     | Flat FRP Non-Metallic type (FRP: Fiber Reinforced Plastics)<br>Nominal thickness 1.0 ± 0.2 mm |
| Outer Sheath            | Material                     | Black HDPE (non Rodent Repellent/Rodent Repellent)                                            |
|                         | Thickness                    | 1.8 ± 0.2 mm                                                                                  |
| Rip Cord                | Material                     | Polyester                                                                                     |
|                         | No.                          | 2                                                                                             |
| Filler Rod              | Material                     | Polyethylene, natural Color                                                                   |
|                         | Diameter                     | 2.2 mm ± 0.2 mm                                                                               |
| Stranding method        | -                            | Reverse oscillating lay (ROL) technique (SZ Direction)                                        |
|                         | -                            | Lay - length 75 mm ± 5 mm                                                                     |
| Tensile Load            | Short term                   | 4000 N                                                                                        |
|                         | Long term                    | 2500 N                                                                                        |
|                         | Pressure                     | ≥ 3400 N / 10 cm                                                                              |
| Overall diameter        | Diameter                     | 9.5 - 12 mm                                                                                   |
| Cable diameter          | Diameter (24/48 core)        | 10.5 ± 1mm / 11.5 ± 1mm.                                                                      |
| Weight                  | (24/48 core)                 | Approx. 85 / 100±10 kg/km                                                                     |
| Span Length             |                              | 40-100m                                                                                       |
| Water Blocking Element  |                              | Dry-core technology                                                                           |
| Width                   |                              | ≥ 126 km/hr                                                                                   |
| Temperature Range       | Operation Temperature        | -40°C to +70 °C                                                                               |
|                         | Installation Temperature     | -40°C to +70 °C                                                                               |
|                         | Storage/Shipping Temperature | -40°C to +75°C                                                                                |
| Color Stripe            |                              | 3 mm ± 0.5mm                                                                                  |

## // BUFFER TUBE STRANDING

| Fiber count | Fiber number per tube | Number of tube / filler | Nom. Diameter(mm) | Nom. Weight(kg/km) |
|-------------|-----------------------|-------------------------|-------------------|--------------------|
| 12          | 6                     | 2/3                     | 11.4 - 12         | 100                |
| 24          | 6                     | 4/1                     | 11.4 - 12         | 100                |
| 48          | 12                    | 4/1                     | 11.8 - 12.5       | 105                |
| 60          | 12                    | 5/0                     | 11.8 - 12.5       | 105                |

## // OPTICAL FIBER CHARACTERISTICS

| CATEGORY                                   | DESCRIPTION        | SPECIFICATIONS                                                                                                                      |
|--------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Optical Specifications                     |                    | ITU-T G.652D(Singlemode OS2)<br>9/125 $\mu\text{m}$ (OS2)<br>ITU-T G651(Multimode)<br>62.5/125 $\mu\text{m}$ , 50/125 $\mu\text{m}$ |
| Attenuation                                | @1310nm            | $\leq 0.35/\leq 0.33\text{dB/km}$                                                                                                   |
|                                            | @1383nm            | $\leq 0.35/\leq 0.31\text{dB/km}$                                                                                                   |
|                                            | @1490nm            | $\leq 0.24\text{dB/km}$                                                                                                             |
|                                            | @1550nm            | $\leq 0.21/\leq 0.19\text{dB/km}$                                                                                                   |
|                                            | @1625nm            | $\leq 0.23/\leq 0.20\text{dB/km}$                                                                                                   |
| Attenuation discontinuity                  |                    | $\leq 0.05\text{ dB}$                                                                                                               |
| Attenuation vs. Wavelength                 | 1285 -1330 @1310nm | $\leq 0.05\text{ dB/km}$                                                                                                            |
|                                            | 1525 -1575@1550nm  | $\leq 0.05\text{ dB/km}$                                                                                                            |
| Zero dispersion wavelength                 |                    | 1300 -1324 nm                                                                                                                       |
| Zero dispersion slope                      |                    | $\leq 0.092\text{ ps}/(\text{nm}^2.\text{km})$                                                                                      |
| Dispersion                                 | @1310nm            | $\leq 3.5\text{ ps}/\text{nm.km}$                                                                                                   |
|                                            | @1550nm            | $\leq 18\text{ ps}/\text{nm.km}$                                                                                                    |
| Polarization mode dispersion(PMD)          |                    | $\leq 0.1\text{ ps}/\text{km}^{1/2}$                                                                                                |
| Cable cutoff wavelength ( $\lambda_{cc}$ ) |                    | $\leq 1260\text{ nm}$                                                                                                               |
| Effective group index of reaction          | @1310nm            | 1.4675                                                                                                                              |
|                                            | @1550nm            | 1.4681                                                                                                                              |
| Geometric Specifications                   |                    |                                                                                                                                     |
| Mode field diameter                        | @1310nm            | $9.2 \pm 0.6\text{ }\mu\text{m}$                                                                                                    |
|                                            | @1550nm            | $10.4 \pm 0.8\text{ }\mu\text{m}$                                                                                                   |
| Cladding diameter                          |                    | $125 \pm 1\text{ }\mu\text{m}$                                                                                                      |
| Cladding non-circularity                   |                    | $\leq 1.0\%$                                                                                                                        |
| Coating Material                           | Material           | UV curable acrylate                                                                                                                 |
|                                            | Diameter           | $250 \pm 5\text{ }\mu\text{m}$                                                                                                      |
| Coating/Cladding concentricity error       |                    | $\leq 12\text{ }\mu\text{m}$                                                                                                        |
| Core/Cladding concentricity error          |                    | $\leq 0.5\text{ }\mu\text{m}$                                                                                                       |
| Color Fiber Diameter                       |                    | $250\text{ }\mu\text{m} \pm 15\text{ }\mu\text{m}$ (Colored)                                                                        |
| Fiber proof-tested                         |                    | 0.69 GPa ( 1.0%, 100kpsi) in accordance with the optical fiber proof test by IEC 60793-1-30                                         |

## // OPTICAL FIBER CHARACTERISTICS

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| Attenuation                                | @1310nm            | $\leq 0.35/\leq 0.33\text{dB/km}$                                                                                                   |
|                                            | @1383nm            | $\leq 0.35/\leq 0.31\text{dB/km}$                                                                                                   |
|                                            | @1490nm            | $\leq 0.24\text{dB/km}$                                                                                                             |
|                                            | @1550nm            | $\leq 0.21/\leq 0.19\text{dB/km}$                                                                                                   |
|                                            | @1625nm            | $\leq 0.23/\leq 0.20\text{dB/km}$                                                                                                   |
| Attenuation discontinuity                  |                    | $\leq 0.05\text{ dB}$                                                                                                               |
| Attenuation vs. Wavelength                 | 1285 -1330 @1310nm | $\leq 0.05\text{ dB/km}$                                                                                                            |
|                                            | 1525 -1575@1550nm  | $\leq 0.05\text{ dB/km}$                                                                                                            |
| Zero dispersion wavelength                 |                    | 1300 -1324 nm                                                                                                                       |
| Zero dispersion slope                      |                    | $\leq 0.092\text{ ps}/(\text{nm}^2.\text{km})$                                                                                      |
| Dispersion                                 | @1310nm            | $\leq 3.5\text{ ps}/\text{nm.km}$                                                                                                   |
|                                            | @1550nm            | $\leq 18\text{ ps}/\text{nm.km}$                                                                                                    |
| Polarization mode dispersion(PMD)          |                    | $\leq 0.1\text{ ps}/\text{km}^{1/2}$                                                                                                |
| Cable cutoff wavelength ( $\lambda_{cc}$ ) |                    | $\leq 1260\text{ nm}$                                                                                                               |
| Effective group index of reaction          | @1310nm            | 1.4675                                                                                                                              |
|                                            | @1550nm            | 1.4681                                                                                                                              |
| Geometric Specifications                   |                    |                                                                                                                                     |
| Mode field diameter                        | @1310nm            | $9.2 \pm 0.6\text{ }\mu\text{m}$                                                                                                    |
|                                            | @1550nm            | $10.4 \pm 0.8\text{ }\mu\text{m}$                                                                                                   |
| Cladding diameter                          |                    | $125 \pm 1\text{ }\mu\text{m}$                                                                                                      |
| Cladding non -circularity                  |                    | $\leq 1.0\%$                                                                                                                        |
| Coating Material                           | Material           | UV curable acrylate                                                                                                                 |
|                                            | Diameter           | $250 \pm 5\text{ }\mu\text{m}$                                                                                                      |
| Coating/Cladding concentricity error       |                    | $\leq 12\text{ }\mu\text{m}$                                                                                                        |
| Core/Cladding concentricity error          |                    | $\leq 0.5\text{ }\mu\text{m}$                                                                                                       |
| Color Fiber Diameter                       |                    | $250\text{ }\mu\text{m} \pm 15\text{ }\mu\text{m}$ (Colored)                                                                        |
| Fiber proof-tested                         |                    | 0.69 GPa ( 1.0%, 100kpsi) in accordance with the optical fiber proof test by IEC 60793-1-30                                         |

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|----------------------------------|--------------|-------------------------------|
| <b>Mechanical Specifications</b> |              |                               |
| Proof test level                 |              | $\geq 1.0\%$                  |
| Fiber curl radius                |              | $\geq 4.0$ m                  |
| Peak coating strip force         |              | 1.3 - 8.9N                    |
| Relative humidity                |              | Up to 90%, no frost           |
| Maximum Span Length              | Sag 0.5%     | 40 m.                         |
|                                  | Sag 1.0%     | 80 m.                         |
| Maximum Wind Velocity            |              | 80 m and wind force 126 Km/hr |
| Max. Tensile load                | Installation | 4000 N. for 6-120 Cores       |
|                                  | Operation    | 1800 N. for 6-120 Cores       |
| Maximum Crush resistance         |              | 2200 N./10 cm.                |
| Minimum bending Radius           | Installation | 20 x Diameter of Cable        |
|                                  | Operation    | 10 x Diameter of Cable        |

## // IDENTIFICATION COLOR CODE OF FIBER AND LOOSE TUBE

The color code of the loose tubes and the individual fibers within each loose tube shall be in accordance TIA/EIA-598-C (Rev.TIA/EIA-598-A) and EIA-359-A

| NO. | FIBER COLOR | LOOSE TUBE COLOR |
|-----|-------------|------------------|
| 1   | Blue        | Blue             |
| 2   | Orange      | Orange           |
| 3   | Green       | Green            |
| 4   | Brown       | Brown            |
| 5   | Slate       | Slate            |
| 6   | White       | White            |
| 7   | Red         | Red              |
| 8   | Black       | Black            |
| 9   | Yellow      | Yellow           |
| 10  | Violet      | Violet           |
| 11  | Rose        | Rose             |
| 12  | Aqua        | Aqua             |

## // PACKING AND DRUM

Standard reel length: 4 km/reel, other length is also available. The cables are packed in fumigated wooden drums.

Unless otherwise specified, the cable sheath marking shall be as follows:

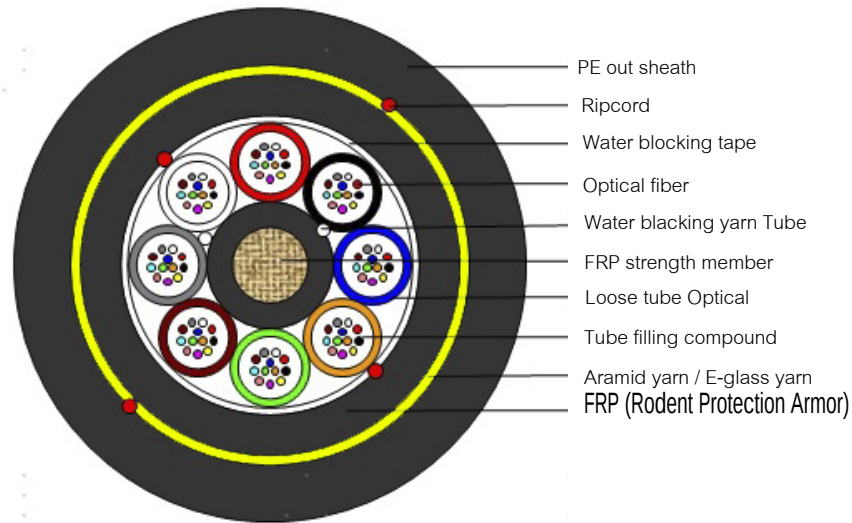
- Color: white.
- Contents: TSP, the year of manufacture, the type of cable, cable number, length marking , Name of organization in English, Thai, Chinese, etc.
- Format to choose from: screen, hot stamp, laser.
- Interval: 1 m.

( Outer sheath marking legend can be changed according to user's requests.)

## // TEST REQUIREMENTS

| Item                                                        | Method                                                                                       | Acceptance criteria                                                                                                           |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Tensile test                                                | - Max. strength: 4000 N                                                                      | -Fiber strain at maximum                                                                                                      |
| IEC 60794-1-2                                               | - Sample length: 100 meter                                                                   | -Load max. 0.33 %                                                                                                             |
| TIA/EIA-455-33A                                             | - Times: 1 hour                                                                              | -Attenuation increase $\leq$ 0.1dB                                                                                            |
| Crush or Compression test                                   | - load: 2200 N                                                                               | -No splits or cracks in the outer jacket                                                                                      |
| IEC 60794-1-2                                               | - Time: 10 minute                                                                            | -Attenuation increase $\leq$ 0.10 dB                                                                                          |
| TIA/EIA-455-41A                                             | - Length: 100 m                                                                              |                                                                                                                               |
| Impact test                                                 | - Impact energy: 450                                                                         | - No splits or cracks in the outer jacke                                                                                      |
| IEC 60794-1-2                                               | - Height: 1 mete                                                                             | -Attenuation increase $\leq$ 0.10 dB (after the test)                                                                         |
| TIA/EIA-455-25C                                             | - Impact points: min.<br>- Number of impacts:                                                |                                                                                                                               |
| Torsion or Twist test                                       | - 1 m cable length with 150 N weigh                                                          | - No splits or cracks in the outer jacke                                                                                      |
| IEC 60794-1-2-E7                                            | - $\pm 180^\circ$ ,10 cycle                                                                  | -Attenuation increase $\leq$ 0.10 dB (after the test)                                                                         |
| TIA/EIA-455-85A                                             |                                                                                              |                                                                                                                               |
| Repeated bending<br>Cable bending Test                      | - Radius = 20 $\times$ cable outer diamete<br>- 1m cable length with 150 N weight, 30 cycle  | - No splits or cracks in the outer jacke<br>-Attenuation increase $\leq$ 0.10 dB (after the test)                             |
| IEC 60794-1-2-E6,<br>TIA/EIA-455-104A<br>IEC 60794-1-2-E11B |                                                                                              |                                                                                                                               |
| Temperature cycling test                                    | - emperature step: +20 °C -40 °C+70 °C-40 °C<br>+70 °C+20 °C                                 | -Attenuation variation for reference<br>value(the attenuation to be measured before<br>test at +20 $\pm$ 3 ) $\leq$ 0.10dB/km |
| IEC 60794-1-2-F1                                            |                                                                                              |                                                                                                                               |
| TIA/EIA-455-3A                                              | - ime per each step: 16 hrs.<br>- N mber of cycles: 2 cycles                                 |                                                                                                                               |
| Water penetration test                                      | - Water height: 1                                                                            | -No water leakage at the end of the sample                                                                                    |
| IEC 60794-1-2-F5                                            | - Sample length:3                                                                            |                                                                                                                               |
| TIA/EIA-455-82B                                             | - Duration of test: 24hr                                                                     |                                                                                                                               |
| Drip test                                                   | - Five 0.3m samples suspended vertically in a climat<br>chamber, raised temperature to +70°C | -No filling compound shall drip from tubes after 24 hrs.                                                                      |
| IEC 60794-1-2-E14                                           |                                                                                              |                                                                                                                               |

## STRUCTURE DESIGN



## ORDER INFORMATION

| NO. OF CORE | DESCRIPTION                                                                   |
|-------------|-------------------------------------------------------------------------------|
| 6           | Indoor/Outdoor, 6C ADSS, Single Jacket FRP, Single Mode 9/125 $\mu\text{m}$   |
| 12          | Indoor/Outdoor, 12C ADSS, Single Jacket FRP, Single Mode 9/125 $\mu\text{m}$  |
| 24          | Indoor/Outdoor, 24C ADSS, Single Jacket FRP, Single Mode 9/125 $\mu\text{m}$  |
| 48          | Indoor/Outdoor, 48C ADSS, Single Jacket FRP, Single Mode 9/125 $\mu\text{m}$  |
| 60          | Indoor/Outdoor, 60C ADSS, Single Jacket FRP, Single Mode 9/125 $\mu\text{m}$  |
| 96          | Indoor/Outdoor, 96C ADSS, Single Jacket FRP, Single Mode 9/125 $\mu\text{m}$  |
| 120         | Indoor/Outdoor, 120C ADSS, Single Jacket FRP, Single Mode 9/125 $\mu\text{m}$ |



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