

Figure-8 Arial Optical Fiber Cable OptoWire AM-S

| Fiber count | KN | Steel wire |
|-------------|--------------|------------|
| 4 – 144 FO | 7.5 – 9.5 KN | 1 |

Description

Fig8 designed cable with wire messenger for arial pole and wall installation.

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 Optowire premium designed cable with optical, mechanical and geometrical characteristics

1.2 Cable name

OptoWire AM-S (4-144)FO (7.5–9.5)KN

1.3 Cable description

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

1.4 Quality

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

1.5 Reliability

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

1.6 Reference

The cable, which OptoWire 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 60794-4 | Optical fiber cables-Part 4: Sectional specification-Aerial optical cables along electrical power lines |
| 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 |
| EIA/TIA 598-C | Color code of fiber optic cables |

Optical Fiber

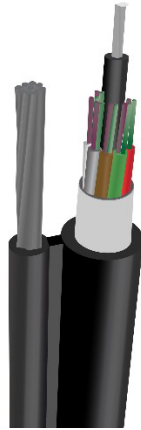
The optical fiber is made of high pure silica and germanium doped silica. UV curable acrylate material is applied over fiber cladding as optical fiber primary protective coating. The detail data of optical fiber performance are shown in the following table.

G. 652D

| Category | Description | Specifications |
|-----------------------------------|--|-------------------------------|
| | | After cabling |
| Optical Specifications | Attenuation @1310 nm | ≤0.36 dB/km |
| | Attenuation @1550 nm | ≤0.22 dB/km |
| | Dispersion @1310nm | ≤3.5 ps/nm·km |
| | Dispersion @1550nm | ≤18.0 ps/nm·km |
| | Zero Dispersion Wavelength | 1300~1324 nm |
| | Zero Dispersion Slope | ≤0.092 ps/nm ² ·km |
| | Macro bending Loss (100 turns; Φ 60 mm) @1550 nm (100 turns; Φ 60 mm) @1625 nm | ≤ 0.05 dB ≤ 0.1 dB |
| | Cable cutoff wavelength λ _{cc} (nm) | ≤1260nm |
| | Mode Field Diameter @1310 nm | 9.2±0.4μm |
| Dimensional Specifications | Cladding Diameter | 125±1μm |
| | Coating diameter | 245±10μm |
| | Core/cladding concentricity error | ≤0.6 μm |
| | Cladding Non-Circularity | ≤1.0 % |
| Mechanical Specifications | Proof stress | ≥0.69Gpa |

3. Cable structure

OptoWire AM-S 4-144 FO 7.5 KN



Dimension and Properties:

| | | | | | | | | | | | | |
|------------|---|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-------------------------------|-----------------------------|
| Physical | Fiber count | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 60 | 72 | 96 | 144 |
| | Number of tube/ filler | 1/5 | 2/4 | 3/3 | 4/2 | 6/0 | 4/2 | 4/2 | 5/1 | 6/0 | 8/0 | 12/0 |
| | Fiber No. per tube | 4 | 4 | 4 | 4 | 4 | 8 | 12 | 12 | 12 | 12 | 12 |
| | Loose tube diameter | 2.0±0.1mm | | | | | | | | | | |
| | CSM diameter | 2.2±0.1mm | | | | | | | | | 3.5±0.1mm (FRP: 2.6±0.1mm) | 6.1±0.1mm FRP 2.6±0.1mm) |
| | Outer sheath thickness | Nominal 1.5mm | | | | | | | | | | |
| | Messenger wire | 1.0±0.1mm*7 | | | | | | | | | | |
| | Messenger outer sheath thickness | Nom.1.5mm | | | | | | | | | | |
| | Cable OD (W*H) | 9.2*17.6 mm±5% | | | | | | | | | 10.5mm*18.9mm ±5% | 13.1mm*21.5mm ±5% |
| | Cable weight (kg/km±15%) | 135 | 136 | 137 | 138 | 141 | 140 | 141 | 143 | 144 | 170 | 220 |
| | Operation temperature range | -40 deg C to + 70 deg C | | | | | | | | | | |
| | Installation temperature range | -20 deg C to + 70 deg C | | | | | | | | | | |
| | Transport and storage temperature range | -40 deg C to + 70 deg C | | | | | | | | | | |
| Mechanical | Max. tensile load | 7500N | | | | | | | | | | |
| | Crush resistance | 1000 N/10cm | | | | | | | | | | |
| | Minimal installation bending radius | 20 x OD | | | | | | | | | | |
| | Minimal operation bending radius | 10 x OD | | | | | | | | | | |

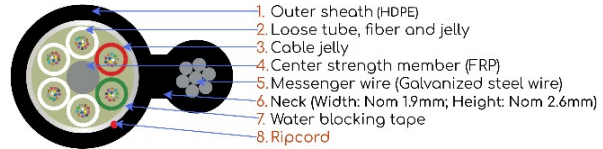
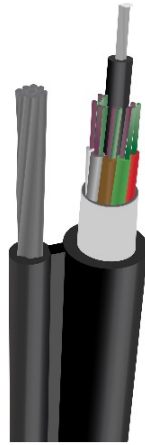
Color code scheme:

| No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|-------------|------|--------|-------|-------|------|-------|-----|-------|--------|--------|------|------|
| Fiber color | Blue | Orange | Green | Brown | Grey | White | Red | Black | Yellow | Violet | Pink | Aqua |
| Tube color | Blue | Orange | Green | Brown | Grey | White | Red | Black | Yellow | Violet | Pink | Aqua |

Notes: from 13 to 24 fiber colors are same with black tracer/strip, instead of 20 fiber/loss tube are with white tracer
Remark: (1-144) FO wind speed 25m/s, ice thickness 15mm, installed sag 1.0%, span 130m.

3. Cable structure

OptoWire AM-S 4-144 FO 9.5 KN



Dimension and Properties:

| | | | | | | | | | | | | |
|------------|---|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-------------------------------|-----------------------------|
| Physical | Fiber count | 4 | 8 | 12 | 16 | 24 | 32 | 48 | 60 | 72 | 96 | 144 |
| | Number of tube/ filler | 1/5 | 2/4 | 3/3 | 4/2 | 6/0 | 4/2 | 4/2 | 5/1 | 6/0 | 8/0 | 12/0 |
| | Fiber No. per tube | 4 | 4 | 4 | 4 | 4 | 8 | 12 | 12 | 12 | 12 | 12 |
| | Loose tube diameter | 2.0±0.1mm | | | | | | | | | | |
| | CSM diameter | 2.2±0.1mm | | | | | | | | | 3.5±0.1mm (FRP: 2.6±0.1mm) | 6.1±0.1mm FRP 2.6±0.1mm) |
| | Outer sheath thickness | Nominal 1.5mm | | | | | | | | | | |
| | Messenger wire | 1.0±0.1mm*7 | | | | | | | | | | |
| | Messenger outer sheath thickness | Nom. 1.5mm | | | | | | | | | | |
| | Cable OD (W*H) | 9.2*17.6 mm±5% | | | | | | | | | 10.5mm*18.9mm ±5% | 13.1mm*21.5mm ±5% |
| | Cable weight (kg/km±15%) | 157 | 159 | 160 | 161 | 164 | 162 | 164 | 165 | 166 | 192 | 243 |
| | Operation temperature range | -40 deg C to + 70 deg C | | | | | | | | | | |
| | Installation temperature range | -20 deg C to + 70 deg C | | | | | | | | | | |
| | Transport and storage temperature range | -40 deg C to + 70 deg C | | | | | | | | | | |
| Mechanical | Max. tensile load | 9500N | | | | | | | | | | |
| | Crush resistance | 1000 N/10cm | | | | | | | | | | |
| | Minimal installation bending radius | 20 x OD | | | | | | | | | | |
| | Minimal operation bending radius | 10 x OD | | | | | | | | | | |

Color code scheme:

| No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|-------------|------|--------|-------|-------|------|-------|-----|-------|--------|--------|------|------|
| Fiber color | Blue | Orange | Green | Brown | Grey | White | Red | Black | Yellow | Violet | Pink | Aqua |
| Tube color | Blue | Orange | Green | Brown | Grey | White | Red | Black | Yellow | Violet | Pink | Aqua |

Notes: from 13 to 24 fiber colors are same with black tracer/stripe, instead of 20 fiber/loss tube are with white tracer

Remark: (1-144) FO wind speed 25m/s, ice thickness 15mm, installed sag 1.0%, span 140m.

4. Test Requirements

Approved by various professional optical and communication product institution, OptoWire also conduct various in-house testing in its own Laboratory and Test Center. OptoWire also conduct test with special arrangement with the Chinese Government Ministry of Quality Supervision & Inspection Center of Optical Communication Products (QSICO). OptoWire 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 |

| 4.1 Tension Loading test | |
|---------------------------------|---|
| Test Standard | IEC 60794-1-21 E3 |
| Sample length | 1000N/10cm |
| Load | 1 minute |
| Duration time | 3 |
| Test results | After test, change of attenuation: $\leq 0.1\text{dB/km}$ |
| | No damage to outer jacket and inner elements |

| 4.2 Crush/Compression Test | |
|-----------------------------------|---|
| Test Standard | IEC 60794-1-21 E3 |
| Load | 1000N/10cm |
| Duration time | 1 minute |
| Test number | 3 |
| Test results | After test, change of attenuation: $\leq 0.1\text{dB/km}$ |
| | No damage to outer jacket and inner elements |

| 4.3 Impact Resistance Test | |
|-----------------------------------|---|
| Test Standard | IEC 60794-1-21 E4 |
| Impact energy | 1J |
| Radius | 300mm |
| Impact points | 3 |
| Impact number | 1 |
| Test result | After test, change of attenuation: $\leq 0.1\text{dB/km}$ |
| | No damage to outer jacket and inner elements |

| 4.4 Repeated Bending Test | |
|----------------------------------|---|
| Test Standard | IEC 60794-1-21 E6 |
| Bending radius | 20 X diameter of cable |
| Cycles | 25 cycles |
| Test result | After test, change of attenuation: $\leq 0.1\text{dB/km}$ |
| | No damage to outer jacket and inner elements |

| 4.5 Torsion/Twist Test | |
|-------------------------------|---|
| Test Standard | IEC 60794-1-21 E7 |
| Sample length | 2m |
| Angles | ± 180 degree |
| cycles | 10 |
| Test result | After test, change of attenuation: $\leq 0.1\text{dB/km}$ |
| | No damage to outer jacket and inner elements |

| 4.6 Bend Test | |
|----------------------|---|
| Test Standard | IEC 60794-1-21 E11A |
| Mandrel radius | 20D |
| Turn number | 4 |
| Number of cycles | 3 |
| Test result | After test, change of attenuation: $\leq 0.1\text{dB/km}$ |
| | No damage to outer jacket and inner elements |

| 4.7 Temperature cycling Test | |
|-------------------------------------|---|
| Test Standard | IEC 60794-1-22 F1 |
| Temperature step | $-20^{\circ}\text{C} \rightarrow +60^{\circ}\text{C}$ |
| Time per each step | 12 hrs |
| Cycles | 2 |
| Test result | Change of attenuation: $\leq 0.15\text{dB/km}$ |

| 4.8 Water penetration Test | |
|-----------------------------------|--|
| Test Standard | IEC 60794-1-22 F5B |
| 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 OptoWire cables are coiled on bakelite, wooden or ironwood 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.

| Optowire Cable Length Type | D*d*B cm D: including seal plate thickness | |
|-------------------------------|---|---------------|
| | 2 km/Reel | 4 km/Reel |
| OptoWire AM-S (4-72)FO-7.5KN | 1.15*0.5*0.71 | 1.25*0.58*1.1 |
| OptoWire AM-S-96FO-7.5KN | 1.15*0.45*0.71 | 1.40*0.76*1.1 |
| OptoWire AM-S-144FO-7.5KN | 1.25*0.58*1.1 | 1.50*0.76*1.1 |
| OptoWire AM-S (4-72)FO-9.5KN | 1.15*0.5*0.71 | 1.50*0.7*0.71 |
| OptoWire AM-S-96FO-9.5KN | 1.15*0.45*0.71 | 1.40*0.76*1.1 |
| OptoWire AM-S-144FO-9.5KN | 1.25*0.58*1.1 | 1.50*0.76*1.1 |

5.2 The color of cable marking is black or other colors. (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 or ironwood drum. Strong wooden batten protection.