

# TECHNICAL SPECIFICATION

## 1. General

### 1.1 Scope

| Cable type                          | Application             |
|-------------------------------------|-------------------------|
| All Dry Single Armored Ribbon Cable | Duct installation cable |

### 1.2 REFERENCE

The cables provided by Navigator® need to pass the following international specifications:

|                                              |                                                                                                   |
|----------------------------------------------|---------------------------------------------------------------------------------------------------|
| IEC 60793-1                                  | Optical fiber Part 1: Generic specifications                                                      |
| IEC 60793-2                                  | Optical fiber Part 2: Product specifications                                                      |
| IEC 60794-1                                  | Optical fiber cable Part 1-2: Generic specification-basic optical cable test procedures           |
| IEC 60794-3-10                               | Outdoor cables- family specification for duct and directly buried optical telecommunication cable |
| 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                                          |
| ITU-T G.657                                  | Characteristics of a single-mode optical fiber and cable                                          |
| EIA/TIA 598                                  | Color code of fiber optic cables                                                                  |
| ANSI/ICEA S-87-640 and Telcordia® GR-20-CORE |                                                                                                   |

### 1.3 QR Guard™

QR Guard™ is a multifunctional online platform that revolutionizes how distributors and network operators keep tabs on the status of Navigator fiber cables, ensuring efficient operations, accurate record-keeping, and valuable insights for future product development. Providing unique features including:

- Distributor exclusive management interface
- Installation record archiving
- Written guidelines and visual demonstrations

QR Guard™ plays a vital role in mitigating the costly consequences of mishandling while enabling efficient network expansion in response to evolving market demands. Scan the QR code in the bottom left corner to find out more.



## 2. OPTICAL FIBER

| ITU-T G.652.D              |                                                       |                                                                       |
|----------------------------|-------------------------------------------------------|-----------------------------------------------------------------------|
| Category                   | Description                                           | Specifications                                                        |
| Optical Specifications     | Attenuation @1310 nm                                  | $\leq 0.40$ dB/km                                                     |
|                            | Attenuation @1550 nm                                  | $\leq 0.30$ dB/km                                                     |
|                            | Zero Dispersion Wavelength                            | 1300~1324 nm                                                          |
|                            | Chromatic dispersion @1310nm<br>@1550nm<br>@1625nm    | $\leq 3.5$ ps/(nm·km)<br>$\leq 18$ ps/(nm·km)<br>$\leq 22$ ps/(nm·km) |
|                            | Zero Dispersion Slope                                 | $\leq 0.092$ ps/nm <sup>2</sup> ·km                                   |
|                            | PMD <sub>Q</sub>                                      | $\leq 0.20$ ps/√km                                                    |
|                            | PMD individual value                                  | $\leq 0.2$ ps/√km                                                     |
|                            | Cable Cutoff Wavelength ( $\lambda_{cc}$ )            | $\leq 1260$ nm                                                        |
|                            | Macro bending Loss (100 turns; $\Phi 60$ mm) @1625 nm | $\leq 0.10$ dB                                                        |
|                            | Mode Field Diameter @1310 nm                          | $9.2 \pm 0.4 \mu\text{m}$                                             |
| Dimensional Specifications | Cladding Diameter                                     | $125 \pm 1 \mu\text{m}$                                               |
|                            | Coating diameter                                      | $245 \pm 10 \mu\text{m}$                                              |
|                            | Core/clad concentricity error                         | $\leq 0.6 \mu\text{m}$                                                |
|                            | Cladding Non-Circularity                              | $< 1.0\%$                                                             |
|                            | Proof stress                                          | $\geq 0.69$ Gpa                                                       |



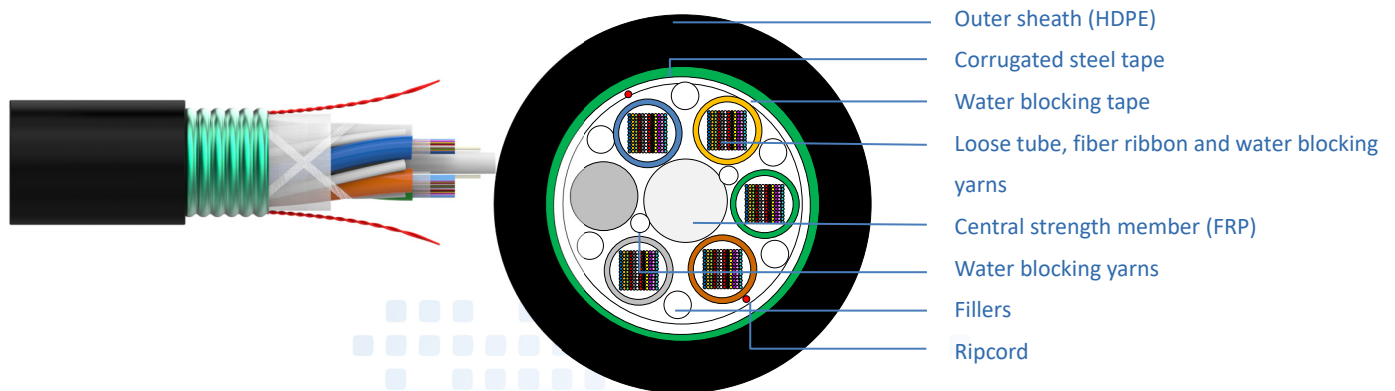
| ITU-T G.657.A1             |                                                                                                                                                                                                          |                                                                                                                                                                                                              |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Category                   | Description                                                                                                                                                                                              | Specifications                                                                                                                                                                                               |
| Optical Specifications     | Attenuation @1310 nm                                                                                                                                                                                     | $\leq 0.40 \text{ dB/km}$                                                                                                                                                                                    |
|                            | Attenuation @1550 nm                                                                                                                                                                                     | $\leq 0.30 \text{ dB/km}$                                                                                                                                                                                    |
|                            | Dispersion coefficient                                                                                                                                                                                   | @1288~1339nm $\leq 3.5 \text{ ps/nm}\cdot\text{km}$<br>@1271~1360nm $\leq 5.3 \text{ ps/nm}\cdot\text{km}$<br>@1550nm $\leq 18 \text{ ps/nm}\cdot\text{km}$<br>@1625nm $\leq 22 \text{ ps/nm}\cdot\text{km}$ |
|                            | Zero Dispersion Wavelength                                                                                                                                                                               | 1300~1324 nm                                                                                                                                                                                                 |
|                            | Zero Dispersion Slope                                                                                                                                                                                    | $\leq 0.092 \text{ ps/nm}^2\cdot\text{km}$                                                                                                                                                                   |
|                            | PMD Link value (M=20cables Q=0.01%)<br>maximum PMDQ                                                                                                                                                      | 0.20 ps/Vkm                                                                                                                                                                                                  |
|                            | Cable Cutoff Wavelength ( $\lambda_{cc}$ )                                                                                                                                                               | $\leq 1260 \text{ nm}$                                                                                                                                                                                       |
|                            | Macro bending Loss<br>(10 turns; $\Phi 30 \text{ mm}$ ) @1550 nm<br>(10 turns; $\Phi 30 \text{ mm}$ ) @1625 nm<br>(1 turns; $\Phi 20 \text{ mm}$ ) @1550 nm<br>(1 turns; $\Phi 20 \text{ mm}$ ) @1625 nm | $\leq 0.25 \text{ dB}$<br>$\leq 1.0 \text{ dB}$<br>$\leq 0.75 \text{ dB}$<br>$\leq 1.5 \text{ dB}$                                                                                                           |
|                            | Mode Field Diameter @1310 nm                                                                                                                                                                             | $8.8 \pm 0.4 \mu\text{m}$                                                                                                                                                                                    |
|                            |                                                                                                                                                                                                          |                                                                                                                                                                                                              |
| Dimensional Specifications | Cladding Diameter                                                                                                                                                                                        | $125 \pm 0.7 \mu\text{m}$                                                                                                                                                                                    |
|                            | Cladding non circularity                                                                                                                                                                                 | $\leq 1.0\%$                                                                                                                                                                                                 |
|                            | Coating diameter                                                                                                                                                                                         | $245 \pm 10 \mu\text{m}$                                                                                                                                                                                     |
|                            | Coating non circularity                                                                                                                                                                                  | $\leq 6\%$                                                                                                                                                                                                   |
|                            | Cladding / coating concentricity error                                                                                                                                                                   | $\leq 6 \mu\text{m}$                                                                                                                                                                                         |
|                            | Core/clad concentricity error                                                                                                                                                                            | $\leq 0.5 \mu\text{m}$                                                                                                                                                                                       |
|                            | Cladding Non-Circularity                                                                                                                                                                                 | $\leq 1.0\%$                                                                                                                                                                                                 |
| Mechanical Specifications  | Proof stress                                                                                                                                                                                             | $\geq 0.69 \text{ Gpa}$                                                                                                                                                                                      |



### 3. CABLE STRUCTURE

#### 3.1 Cable type

All Dry Single Armored Ribbon Cable



#### Features & Application

- High fiber density
- Easy connection
- Perfect cable structure
- Saving the source of duct
- All dry environmentally friendly water blocking materials

#### Dimensions and Properties

|            | Fiber count                             | 144                                    | 288                      |
|------------|-----------------------------------------|----------------------------------------|--------------------------|
| Physical   | Fiber type                              | ITU-T G.652.D or ITU-T G.657.A1        |                          |
|            | Stranding No.                           | 5                                      |                          |
|            | No. of fiber. per tube                  | 12 fiber ribbon*4 layers               | 12 fiber ribbon*6 layers |
|            | Cable D – mm(in)                        | 22.7(0.89)                             | 25.7(1.01)               |
|            | Cable weight - kg/km(lb/1000ft)         | 436(293)                               | 531(357)                 |
|            |                                         |                                        |                          |
| Properties | Operation temperature range             | -40°C to + 70 °C (-40 ° F to 158 ° F)  |                          |
|            | Installation temperature range          | -30 °C to + 60 °C (-22 ° F to 140 ° F) |                          |
|            | Transport and storage temperature range | -40 °C to + 70 °C (-40 ° F to 158 ° F) |                          |
|            | Max. tensile load (MAT) – N(lb)         | 2700(607)                              |                          |
|            | Crush resistance- N/10cm(lb/in)         | 1500(86)                               |                          |
|            | Minimal installation bending radius     | 20*D                                   |                          |
|            | Minimal operation bending radius        | 10*D                                   |                          |

\*Note: D =cable diameter;



## 4. TEST REQUIREMENTS

### Fiber test standard

|                                    |                |
|------------------------------------|----------------|
| 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 |

### Performance testing list

#### 4.1 Tensile strength test

|                     |                                                  |
|---------------------|--------------------------------------------------|
| Reference standards | Telcordia® GR-20-CORE 6.5.6 OR IEC 60794-1-21 E1 |
| Sample length       | No less than 50 meters                           |
| Load                | MAT                                              |
| Duration time       | 1 minute                                         |
| Test results        | Additional attenuation $\leq 0.10\text{dB}$      |
|                     | No damage to outer jacket and inner elements     |

#### 4.2 Compressive strength test

|                     |                                                  |
|---------------------|--------------------------------------------------|
| Reference standards | Telcordia® GR-20-CORE 6.5.5 OR IEC 60794-1-21 E3 |
| Load                | Crush resistance                                 |
| Test number         | 3                                                |
| Duration time       | 1minute                                          |
| Test results        | Additional attenuation $\leq 0.10\text{dB}$      |
|                     | No damage to outer jacket and inner elements     |

#### 4.3 Impact resistance test

|                     |                                                  |
|---------------------|--------------------------------------------------|
| Reference standards | Telcordia® GR-20-CORE 6.5.4 OR IEC 60794-1-21 E4 |
| Impact energy       | 5J                                               |
| Radius              | 12.5mm                                           |



|               |                                              |
|---------------|----------------------------------------------|
| Impact points | 5                                            |
| Impact number | 1                                            |
| Test result   | Additional attenuation $\leq 0.10\text{dB}$  |
|               | No damage to outer jacket and inner elements |

#### 4.4 Cyclic flexing test

|                     |                                                         |
|---------------------|---------------------------------------------------------|
| Reference standards | <b>Telcordia® GR-20-CORE 6.5.8 OR IEC 60794-1-21 E6</b> |
| Bending radius      | 20*D                                                    |
| Cycles              | 25 cycles                                               |
| Load                | 250N                                                    |
| Test result         | Additional attenuation $\leq 0.10\text{dB}$             |
|                     | No damage to cable elements                             |

#### 4.5 Bend test

|                     |                                                          |
|---------------------|----------------------------------------------------------|
| Reference standards | <b>Telcordia® GR-20-CORE 6.5.3 OR IEC 60794-1-21 E11</b> |
| Mandrel diameter    | 20*D                                                     |
| Turn number         | 3                                                        |
| Cycles              | 4                                                        |
| Test result         | Additional attenuation $\leq 0.05\text{dB}$              |
|                     | No damage to outer jacket and inner elements             |

#### 4.6 Twist test

|                     |                                                         |
|---------------------|---------------------------------------------------------|
| Reference standards | <b>Telcordia® GR-20-CORE 6.5.7 OR IEC 60794-1-21 E7</b> |
| Sample length       | 1m                                                      |
| Angles              | $\pm 90$ degree                                         |
| Load                | 150N                                                    |
| Cycles              | 10                                                      |
| Test result         | Additional attenuation $\leq 0.10\text{dB}$             |
|                     | No damage to cable elements                             |

#### 4.7 Abrasion test

|                     |                                                           |
|---------------------|-----------------------------------------------------------|
| Reference standards | <b>Telcordia® GR-20-CORE 6.6.6 OR IEC 60794-1-21 E2B</b>  |
| Experiment method   | The wool felt should be thoroughly impregnated with water |
| Frequency           | 6-12cycles/min                                            |
| Load                | 20N                                                       |
| Cycles              | 10                                                        |
| Test result         | The marking should be legible after test                  |



#### 4.8 Water penetration test

|                        |                                                      |
|------------------------|------------------------------------------------------|
| Reference standards    | Telcordia® GR-20-CORE 6.6.7 OR IEC 60794-1-22 F5     |
| Height of water column | 1m                                                   |
| Sample length          | 3m                                                   |
| Test time              | 24 hours                                             |
| Test result            | No water seepage from the opposite end of the sample |

#### 4.9 Temperature cycling test

|                     |                                                                                                               |
|---------------------|---------------------------------------------------------------------------------------------------------------|
| Reference standards | Telcordia® GR-20-CORE 6.6.3 OR IEC 60794-1-22 F1                                                              |
| Temperature step    | +20 °C→-30 °C →+60 °C→+20 °C                                                                                  |
| Time per each step  | 12 hours                                                                                                      |
| Cycles              | 2                                                                                                             |
| Test result         | Attenuation variation for reference value (the attenuation to be measured before test at +20±3 °C) ≤0.15dB/km |

#### 4.10 Environmental performance

|               |                |
|---------------|----------------|
| Test Standard | RoHS           |
| Test result   | Pass the test. |

Remark: The test wavelength is 1550 nm.

### 5. COLOR CODE SCHEME

|             |      |        |       |       |       |       |     |       |        |        |      |      |
|-------------|------|--------|-------|-------|-------|-------|-----|-------|--------|--------|------|------|
| Fiber color | blue | orange | green | brown | slate | white | red | black | yellow | violet | pink | aqua |
| Tube color  | blue | orange | green | brown | /     | /     | /   | /     | /      | /      | /    | /    |

Note: the numbers 1-12 will be printed on the ribbon.

### 6. SHEATH MARKING

