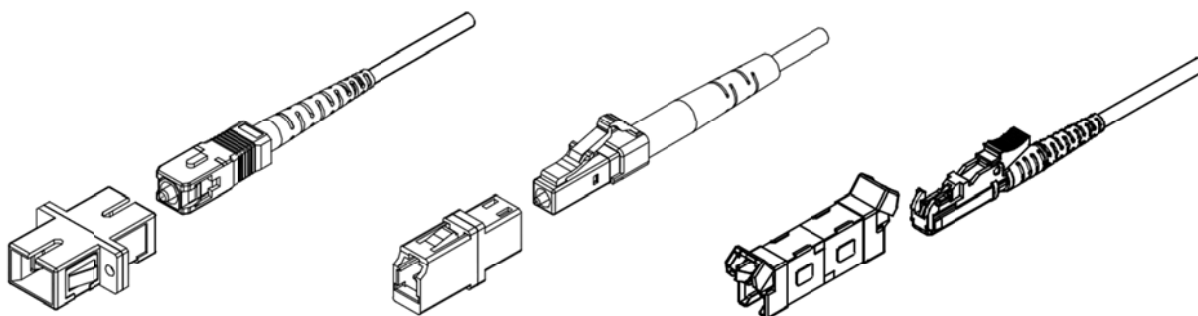


# TECHNICAL SPECIFICATION for OPTICAL FIBER PATCH CORD / PIGTAIL



## 1. Scope:

This specification is applicable to optical fiber patch cord, pigtail and with optical connectors.

The pigtail is single fiber cables pre-assembled with a connector at one end. They are typically used to terminate primary coated fiber to optical equipment.

The patch cord is single fiber cables pre-assembled with a connector at both end. They are typically used to cross-connect patch panel to patch panel and to inter-connect patch panels to optical equipment.

## 2. Ordering Information/Part Number:

OPC

| Optical Patch Cord | Fiber Type                     | Connector Type          | Polishing Type | Connector Type          | Polishing Type | Cable Length [m] | Cable Type           | Cable Diameter |
|--------------------|--------------------------------|-------------------------|----------------|-------------------------|----------------|------------------|----------------------|----------------|
|                    | G.652 [9/125]                  | SC, FC, LC, ST          | SPC            | SC, FC, LC, ST          | SPC            | 1~999            | SP: Simplex          | ø 0.9          |
|                    | G.657 [9/125]<br>G.655 [9/125] | MTRJ, MU                | UPC            | MTRJ, MU                | UPC            |                  | DP: Duplex Zip cord  | ø 2.0          |
|                    | OM1 [62/125]                   | E2000, MIL, ESCON, FDDI | APC            | E2000, MIL, ESCON, FDDI | APC            |                  | R: Duplex Round cord | ø 2.4          |
|                    | OM2 [50/125]                   | SMA, LX5                |                | SMA, LX5                |                |                  | Other                | ø 3.0          |
|                    | OM3 [50/125]<br>OM4 [50/125]   | Other                   |                | Other                   |                |                  |                      | ø 5.5          |
|                    | PM [Polarization Maintaining]  |                         |                |                         |                |                  |                      | Other          |

## 3. Features and Benefits:

- Telcordia GR-326-Core Issue 3
- Compliant with : JIS C-5973, IEC
- Optical performance 100% factory tested
- Customized assemblies available include of lengths
- Connector styles and performance
- Minimum loss

## 4. Application:

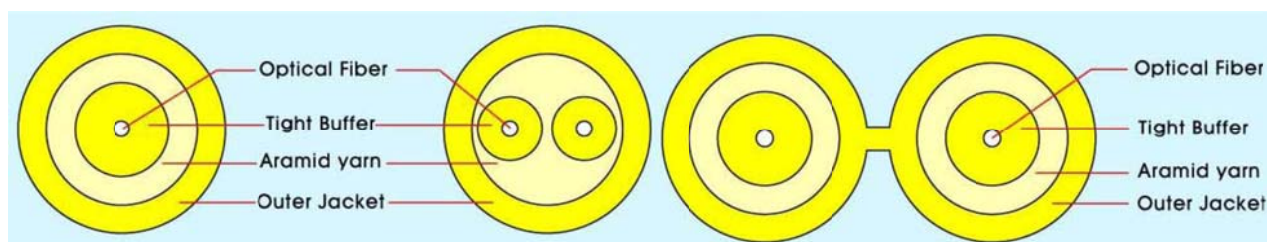
- Telecommunication Networks
- CATV Networks
- Active Device Termination
- Local Area Networks
- Data system networks

## 5. Specification:

### 1) Optical Fiber Character

| ATTRIBUTE |                                | DETAIL                                 | G.652                           | G.657             |         |                   |                   |        |  |
|-----------|--------------------------------|----------------------------------------|---------------------------------|-------------------|---------|-------------------|-------------------|--------|--|
|           |                                |                                        | G.652.D                         | G.657.A           |         | G.657.B           |                   |        |  |
| Fiber     | Mode field diameter            | Wavelength                             | 1310 nm                         | 1310 nm           |         | 1310nm            |                   |        |  |
|           |                                | Range of normal values                 | 8.6~9.5 μm                      | 8.6~9.5 μm        |         | 6.3~9.5 μm        |                   |        |  |
|           |                                | Tolerance                              | ±0.7 μm                         | ±0.4 μm           |         | ±0.4 μm           |                   |        |  |
|           | Cladding diameter              | Nominal                                | 125.0 μm                        | 125.0 μm          |         | 125.0 μm          |                   |        |  |
|           |                                | Tolerance                              | ±1.0 μm                         | ±0.7 μm           |         | ±0.7 μm           |                   |        |  |
|           | Core concentricity error       | Maximum                                | 0.8 μm                          | 0.5 μm            |         | 0.5 μm            |                   |        |  |
|           | Cladding noncircularity        | Maximum                                | 2.0%                            | 1.0%              |         | 1.0%              |                   |        |  |
|           | Cable cut-off wavelength       | Maximum                                | 1260 nm                         | 1260 nm           |         | 1260 nm           |                   |        |  |
|           | Macrobending loss              | Radius                                 | 30 mm                           | 15 mm             | 10mm    | 15 mm             | 10mm              | 7.5mm  |  |
|           |                                | Number of turns                        | -                               | 10                | 1       | 10                | 1                 | 1      |  |
|           |                                | Maximum at 1550nm                      | -                               | 0.25 dB           | 0.75 dB | 0.03 dB           | 0.1 dB            | 0.5 dB |  |
|           |                                | Maximum at 1625nm                      | 0.50 dB                         | 1.0 dB            | 1.5 dB  | 0.1 dB            | 0.2 dB            | 1.0 dB |  |
|           | Proof stress                   | Minimum                                | 0.69 Gpa                        | 0.69 Gpa          |         | 0.69 Gpa          |                   |        |  |
|           | Chromatic dispersion           | λo min                                 | 1300 nm                         | 1300 nm           |         | Note <sup>④</sup> |                   |        |  |
|           |                                | λo max                                 | 1324 nm                         | 1324 nm           |         | Note <sup>④</sup> |                   |        |  |
|           |                                | coefficient                            | So max (ps/nm <sup>2</sup> .km) | 0.093             | 0.092   |                   | Note <sup>④</sup> |        |  |
|           | Uncabled fiber PMD coefficient | Maximum (ps/√km)                       | Note <sup>①</sup>               | Note <sup>①</sup> |         | Note <sup>①</sup> |                   |        |  |
| Cable     | Attenuation coefficient        | Maximum at 1310 nm                     | -                               | -                 |         | 0.5 dB/km         |                   |        |  |
|           |                                | Max. from 1310 to 1625 nm <sup>②</sup> | 0.4 dB/km                       | 0.4 dB/km         |         | -                 |                   |        |  |
|           |                                | Maximum at 1383±3 nm <sup>③</sup>      | Note                            | Note              |         | -                 |                   |        |  |
|           |                                | Maximum at 1550 nm                     | 0.3 dB/km                       | 0.3 dB/km         |         | 0.3 dB/km         |                   |        |  |
|           |                                | Maximum at 1625 nm                     | -                               | -                 |         | 0.4 dB/km         |                   |        |  |
|           | PMD coefficient                | M                                      | 20 cables                       | 20 cables         |         | Note <sup>⑤</sup> |                   |        |  |
|           |                                | Q                                      | 0.01%                           | 0.01%             |         | Note <sup>⑤</sup> |                   |        |  |
|           |                                | Maximum PMDQ                           | 0.20 ps/√km                     | 0.20 ps/√km       |         | Note <sup>⑤</sup> |                   |        |  |

### 2) Optical Cable Character



These tight buffered cable is designed for indoor inter-equipment connections and or are in controlled environments for FTTH. The inside cable is used for installation through a duct or conduit of placed on ceiling walls. They are also suitable for computer data or TV links, home automation system, terminal link, inter ramie and internal connections. The tight buffered cable designs add polymer to the coating directly on the fiber with diameter up to 900 $\mu\text{m}$  and has a buffer layer of reinforcing Aramid Yarn followed by an extruded outer jacket with a diameter.

## ◎ FEATURES

- Small, flexible construction
- Easy identification of individual fibers
- Aramid yarn reinforcement for ruggedized protection
- Highly flexible for ease of routing
- Easy to strip and terminate
- Jacket materials : PVC, PU, LSZH etc
- Storage temperature : -20 ~ 70℃
- Operation temperature : -40 ~ 70℃
- UL listed riser rated OFNR (UL\_1651)

## ◎ APPLICATIONS

- Designed to interconnecting equipment
- Can be bundled as the Breakout Cable for indoor wiring
- Available directly assembled with connectors as pigtail or patch cord
- Communications closet to wall outlets
- Other designs of cables are also available

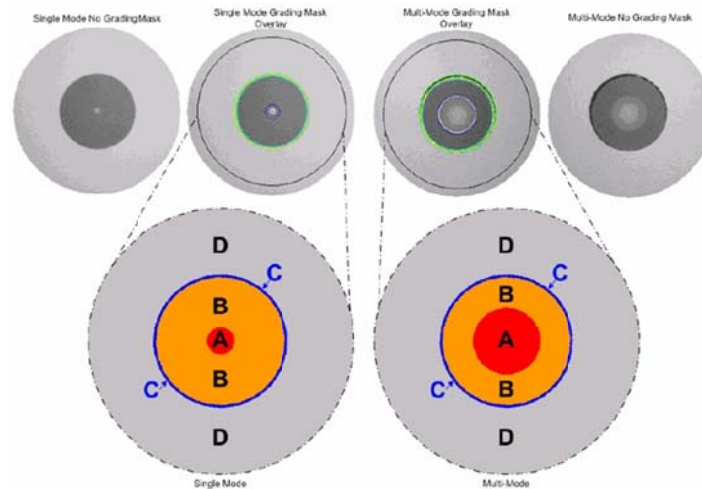
## ◎ DIMENSION

| ITEM    | Outer Diameter (mm) | Weight (kg) | Max Tensile Load (kg) | Min Bending Radius |           |
|---------|---------------------|-------------|-----------------------|--------------------|-----------|
|         |                     |             |                       | Installation       | Operation |
| Simplex | 1.6                 | 2.5         | 10                    | D x 20             | D x 10    |
|         | 2.0                 | 5.0         | 15                    |                    |           |
|         | 3.0                 | 11.5        | 30                    |                    |           |
| Duplex  | 1.6 x 3.2           | 6           | 20                    |                    |           |
|         | 2.0 x 4.0           | 8           | 30                    |                    |           |
|         | 3.0 x 6.1           | 16          | 50                    |                    |           |

### 3) Optical Connector Character

- Visual Inspection (IEC 61300-3-35)

|                                                                                       | Core*         | Critical Zone (A)  | Cladding (B) | Epoxy (C)     | Contact (D)   |
|---------------------------------------------------------------------------------------|---------------|--------------------|--------------|---------------|---------------|
| Single Mode                                                                           | 8 to 10 μm    | 0 to 25 μm         | 25 to 120 μm | 120 to 130 μm | 130 to 250 μm |
| Multi-Mode                                                                            | 50 or 62.5 μm | 0 to 50 or 62.5 μm | 25 to 120 μm | 120 to 130 μm | 130 to 250 μm |
| *The Core is not detailed in the Single Mode Blow Up, however it is a part of Zone A. |               |                    |              |               |               |



|                                      |               |                    | 2,3<br>Allowable Defects and Scratches                     |                               |
|--------------------------------------|---------------|--------------------|------------------------------------------------------------|-------------------------------|
| Zone                                 | Description   | Diameter           | 4,5<br>Defects (diameter)                                  | 6<br>Scratches (width)        |
| A                                    | Critical Zone | 25 $\mu$ m         | None visible @ 200X                                        | None visible @ 200X           |
| B                                    | Cladding Zone | 25 to 120 $\mu$ m  | any <2 $\mu$ m<br>5 from 2 - 5 $\mu$ m<br>None > 5 $\mu$ m | None > 3 $\mu$ m <sup>1</sup> |
| C                                    | Adhesive Zone | 120 to 130 $\mu$ m | none > 10 $\mu$ m                                          | any scratch ok                |
| D                                    | Contact Zone  | 130 to 250 $\mu$ m | none > 10 $\mu$ m                                          | any scratch ok                |
| Inspection is Performed at 200X      |               |                    |                                                            |                               |
| Superscript #s indicates Notes Below |               |                    |                                                            |                               |

**Note**

1. When inspecting after polishing or while performing quality assurance of a new connector, a limit of five fine scratches (<3  $\mu$ m) may be set in Zone B in order to establish that a reliable process is being used by the manufacturer.
2. Any contaminants that are removable must be cleaned from the end-face.
3. Any defects or scratches that extend across multiple zones are subject to the most stringent criteria.
4. The size of a defect equals the smallest circle that completely encompasses the defect.
5. Defects are defined as “permanent non-linear features”. This includes contamination, pits, etc.
6. Scratches are defined as “permanent linear features”.

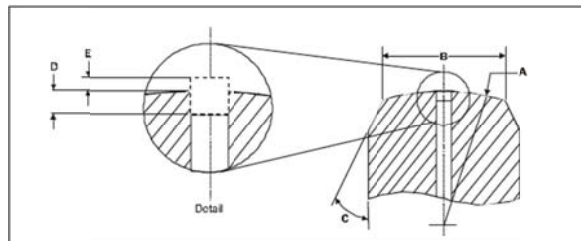
● **Optical Character**

| Characteristics | Conditions                  | Value         |               |
|-----------------|-----------------------------|---------------|---------------|
|                 |                             | Premium       | Standard      |
| Insertion Loss  | Against Reference connector | $\leq$ 0.1 dB | $\leq$ 0.3 dB |
| Return Loss     | SPC                         | >40dB         |               |
|                 | UPC                         | >50dB         |               |
|                 | APC                         | >60dB         |               |

● Mechanical and Environment Properies (Telcordai GR-326 core)

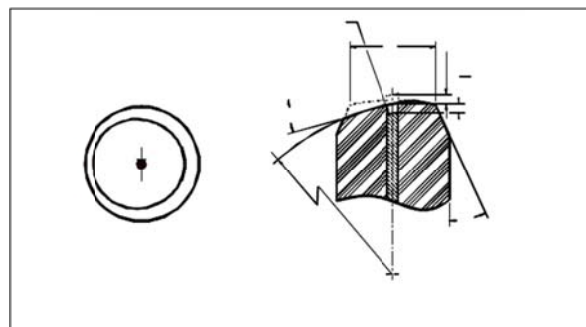
| Characteristics     | Conditions                         | Value  |
|---------------------|------------------------------------|--------|
| Durability          | 500matings                         | <0.2dB |
| Temperature Cycling | -40 ~ +80℃ (42 cycles)             | <0.2dB |
| Humidity Cycling    | 75℃, 95% / 336hr                   | <0.2dB |
| Vibration           | 10 ~ 55Hz (2Hr)                    | <0.2dB |
| Flex Test           | 0°→90°→0°→90°, 5kgf (100cycles)    | <0.2dB |
| Twist Test          | ø0.9mm : 0.75kgf, ø2.0mm : 1.35kgf | <0.2dB |
| Straight Pull Test  | 100N Load                          | <0.2dB |
| Impact              | 1.5m drop, 8 times                 | <0.2dB |

● PC Type Optical Connector End-Face Geometry



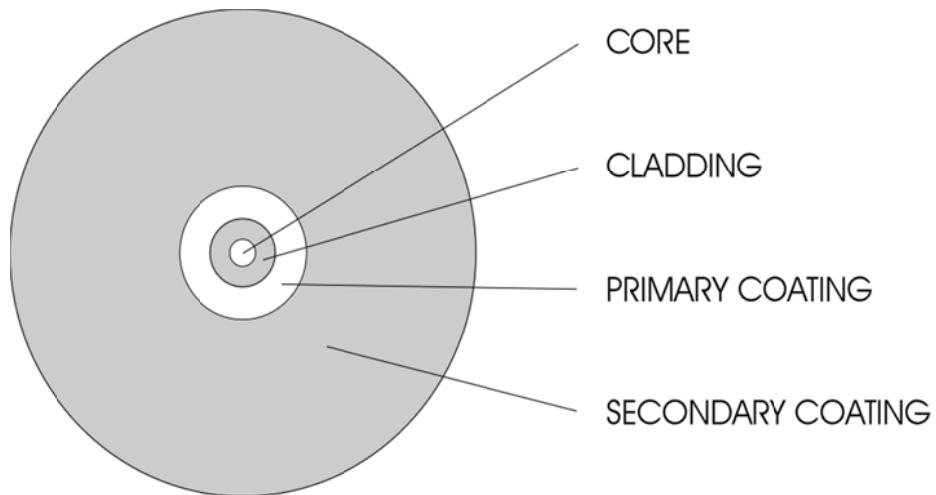
| Item       | Reference | Minimum | Nominal | Maximum     | Dimensions |
|------------|-----------|---------|---------|-------------|------------|
| Radius     | A         | 10      |         | 25          | mm         |
| Pedestal   | B         | 1.75    | 1.9     | 2.26        | mm         |
| Dome ECC.  | —         | 0       | —       | 0.050       | mm         |
| Chamfer    | C         | 25      | 30      | 35          | degrees    |
| Undercut   | D         | —       | —       | See Graph A | nm         |
| Protrusion | E         | —       | —       | 50          | Nm         |

● APC Type Optical Connector End-Face Geometry



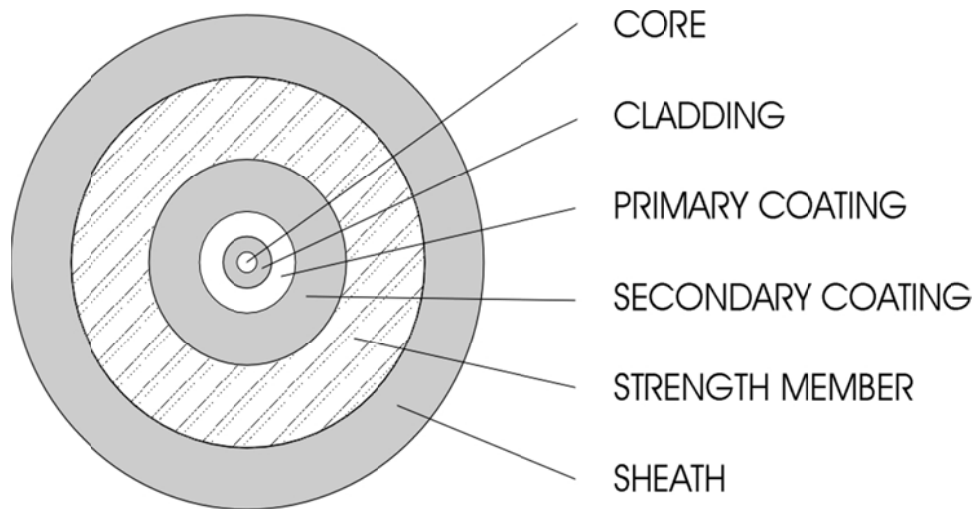
| Item       | Reference | Minimum | Nominal | Maximum | Dimensions |
|------------|-----------|---------|---------|---------|------------|
| Radius     | A         | 5       | -       | 12      | mm         |
| Pedestal   | B         | 0.8     | -       | 1.7     | mm         |
| Dome ECC.  | -         | 0       | -       | 0.050   | mm         |
| Chamfer    | C         | 25      | -       | 35      | degrees    |
| Undercut   | D         | -       | -       | 100     | nm         |
| Protrusion | E         | -       | -       | 100     | nm         |

FIGURE 1. THE CONSTRUCTION OF OPTICAL FIBER (0.9mm Tight Buffer)



| ITEM        |                    | DESCRIPTION |                                   |
|-------------|--------------------|-------------|-----------------------------------|
| GLASS FIBER | CORE               | MATERIAL    | SILICA-GLASS                      |
|             |                    | MFD         | $9.5 \pm 0.7 \mu\text{m}$         |
|             | CLADDING           | MATERIAL    | SILICA-GLASS                      |
|             |                    | DIAMETER    | $125 \pm 1 \mu\text{m}$           |
| COATING     | PRIMARY (BUFFER)   | MATERIAL    | UV CURABLE ACRYLATE OR EQUIVALENT |
|             |                    | DIAMETER    | $0.245 \pm 0.020 \text{ mm}$      |
|             | SECONDARY (JACKET) | MATERIAL    | NYLON / PVC OR EQUIVALENT         |
|             |                    | DIAMETER    | $0.9 \pm 0.1 \text{ mm}$          |

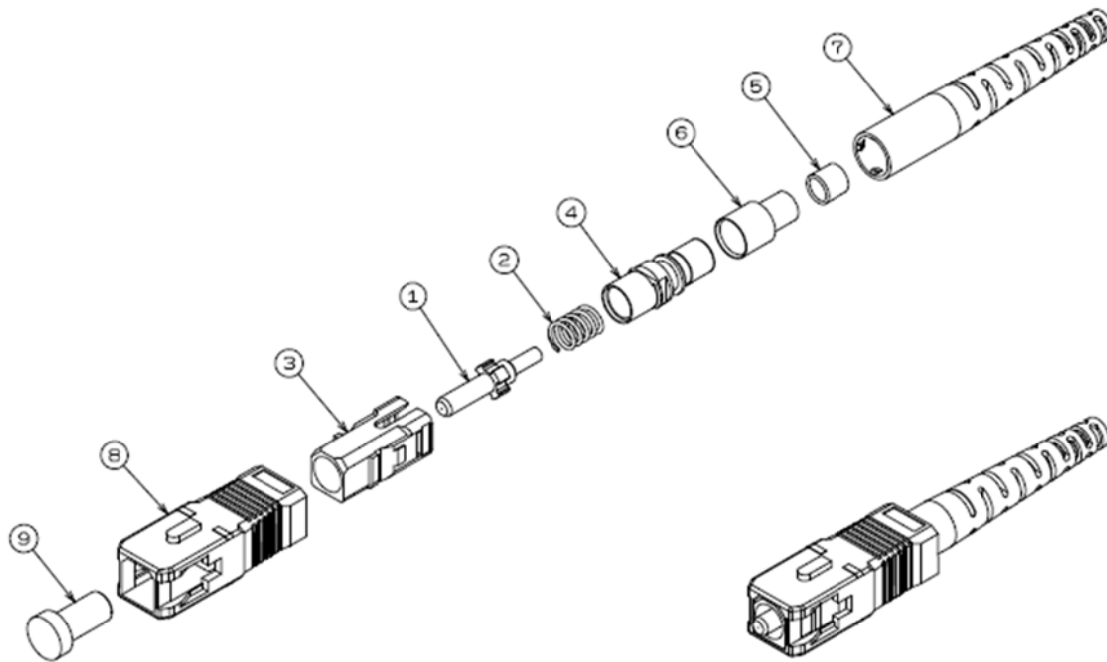
FIGURE 2. THE CONSTRUCTION OF OPTICAL FIBER (2.0 ~ 3.0 mm )



| ITEM            |                    | DESCRIPTION |                                   |              |
|-----------------|--------------------|-------------|-----------------------------------|--------------|
| GLASS FIBER     | CORE               | MATERIAL    | SILICA-GLASS                      |              |
|                 |                    | MFD         | 9.5 ± 0.7                         |              |
|                 | CLADDING           | MATERIAL    | SILICA-GLASS                      |              |
|                 |                    | DIAMETER    | 125 ± 1 μm                        |              |
| COATING         | PRIMARY (BUFFER)   | MATERIAL    | UV CURABLE ACRYLATE OR EQUIVALENT |              |
|                 |                    | DIAMETER    | 0.245 ± 0.020 mm                  |              |
|                 | SECONDARY (JACKET) | MATERIAL    | NYLON / PVC OR EQUIVALENT         |              |
|                 |                    | DIAMETER    | 0.9 ± 0.1 mm                      |              |
| STRENGTH MEMBER |                    | MATERIAL    | ARAMID FIBER                      |              |
|                 |                    | DIAMETER    | APPROX. 1.5 mm                    |              |
| SHEATH          |                    | MATERIAL    | PVC                               |              |
|                 |                    | DIAMETER    | 2.0 mm                            | 2.0 ± 0.2 mm |
|                 |                    |             | 3.0 mm                            | 3.0 ± 0.2 mm |

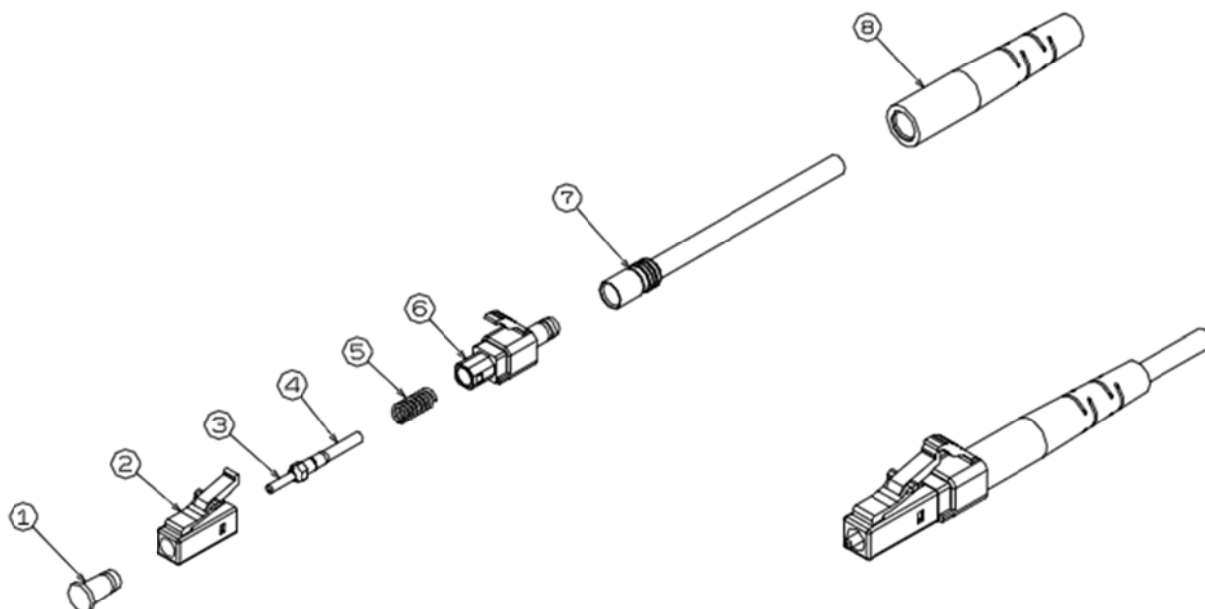
FIGURE 3. THE CONSTRUCTION OF OPTICAL CONNECTOR

1) SC TYPE



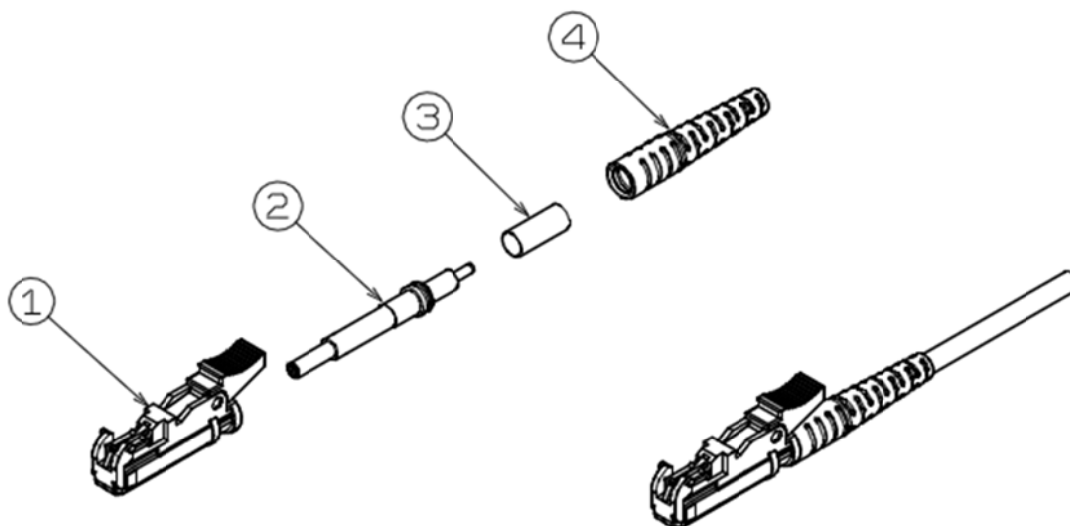
| SM SC/APC CONNECTOR 3.0mm |                |             |       |       |
|---------------------------|----------------|-------------|-------|-------|
| NO                        | NAME           | MATERIAL    | COLOR | PIECE |
| 1                         | Ferrule Flange | Zr + SUS303 | -     | 1     |
| 2                         | Spring         | SUS304      | -     | 1     |
| 3                         | Plug Frame     | PBT         | White | 1     |
| 4                         | Stop Ring      | Brass       | -     | 1     |
| 5                         | Ring           | Brass       | -     | 1     |
| 6                         | Crimp Ring     | Al          | -     | 1     |
| 7                         | Bellcore Boot  | Elastmer    | Green | 1     |
| 8                         | Housing        | PBT         | Green | 1     |
| 9                         | Dust Cap       | PE          | Clear | 1     |

## 2) LC TYPE



| SM LC/UPC CONNECTOR 2.0mm |                            |                        |        |       |
|---------------------------|----------------------------|------------------------|--------|-------|
| NO                        | NAME                       | MATERIAL               | COLOR  | PIECE |
| 1                         | Dust cap                   | PP                     | White  | 1     |
| 2                         | Plug Housing               | PEI                    | Blue   | 1     |
| 3                         | Ferrule Flange             | Zr + SUS303            | -      | 1     |
| 4                         | Tube                       | Teflon                 | -      | 1     |
| 5                         | Spring                     | SUS304                 | -      | 1     |
| 6                         | Frame                      | PEL                    | Blue   | 1     |
| 7                         | Crimp Sleeve & Shrink Tube | AL                     | Yellow | 1     |
| 8                         | Cable Support (Boot)       | Thermoplastic Elastmer | Grey   | 1     |

### 3) E2000



| SM E2000/APC CONNECTOR 3.0mm |                     |                        |       |       |
|------------------------------|---------------------|------------------------|-------|-------|
| NO                           | NAME                | MATERIAL               | COLOR | PIECE |
| 1                            | Plug Housing        | PEI                    | Green | 1     |
| 2                            | Ferrule Flange      | Zr + SUS303            | -     | 1     |
| 3                            | Crimp Ring          | Al                     | -     | 1     |
| 4                            | Cable Support(Boot) | Thermoplastic Elastmer | Green | 1     |

FIGURE 4. THE CONSTRUCTION OF ASSEMBLED PIGTAIL

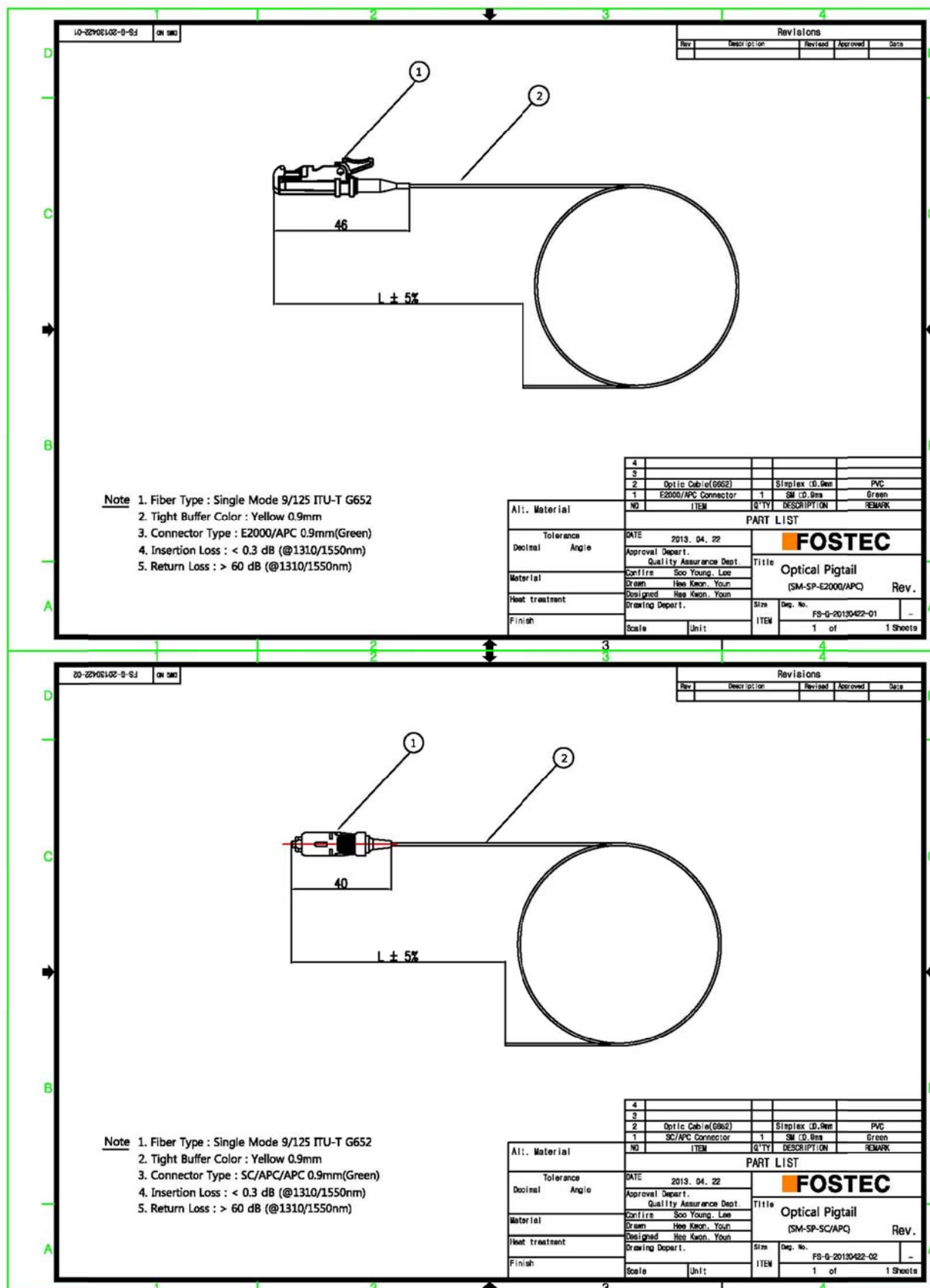


FIGURE 5-1 . THE CONSTRUCTION OF ASSEMBLED PATCH CORD

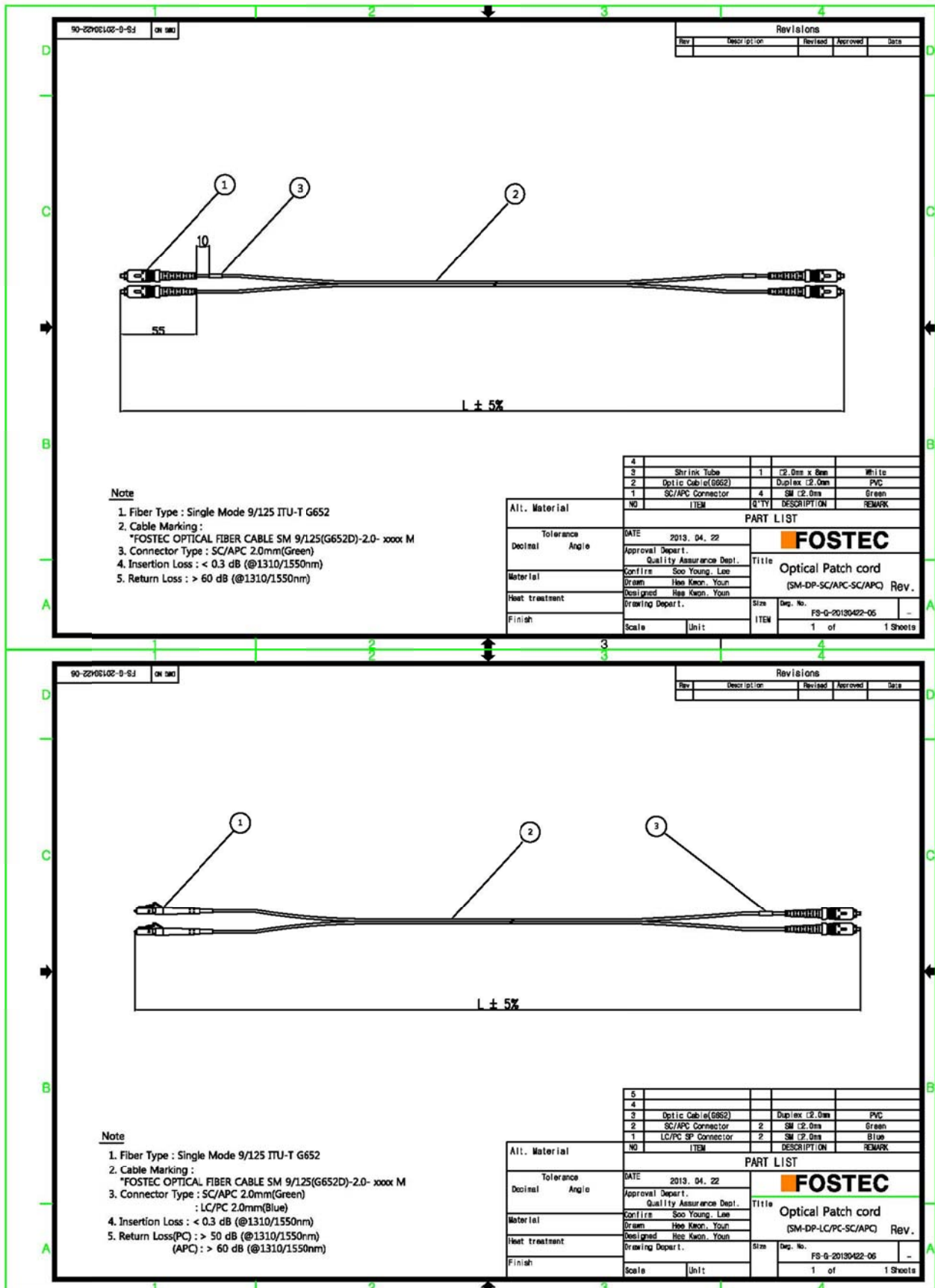


FIGURE 5-2 . THE CONSTRUCTION OF ASSEMBLED PATCH CORD

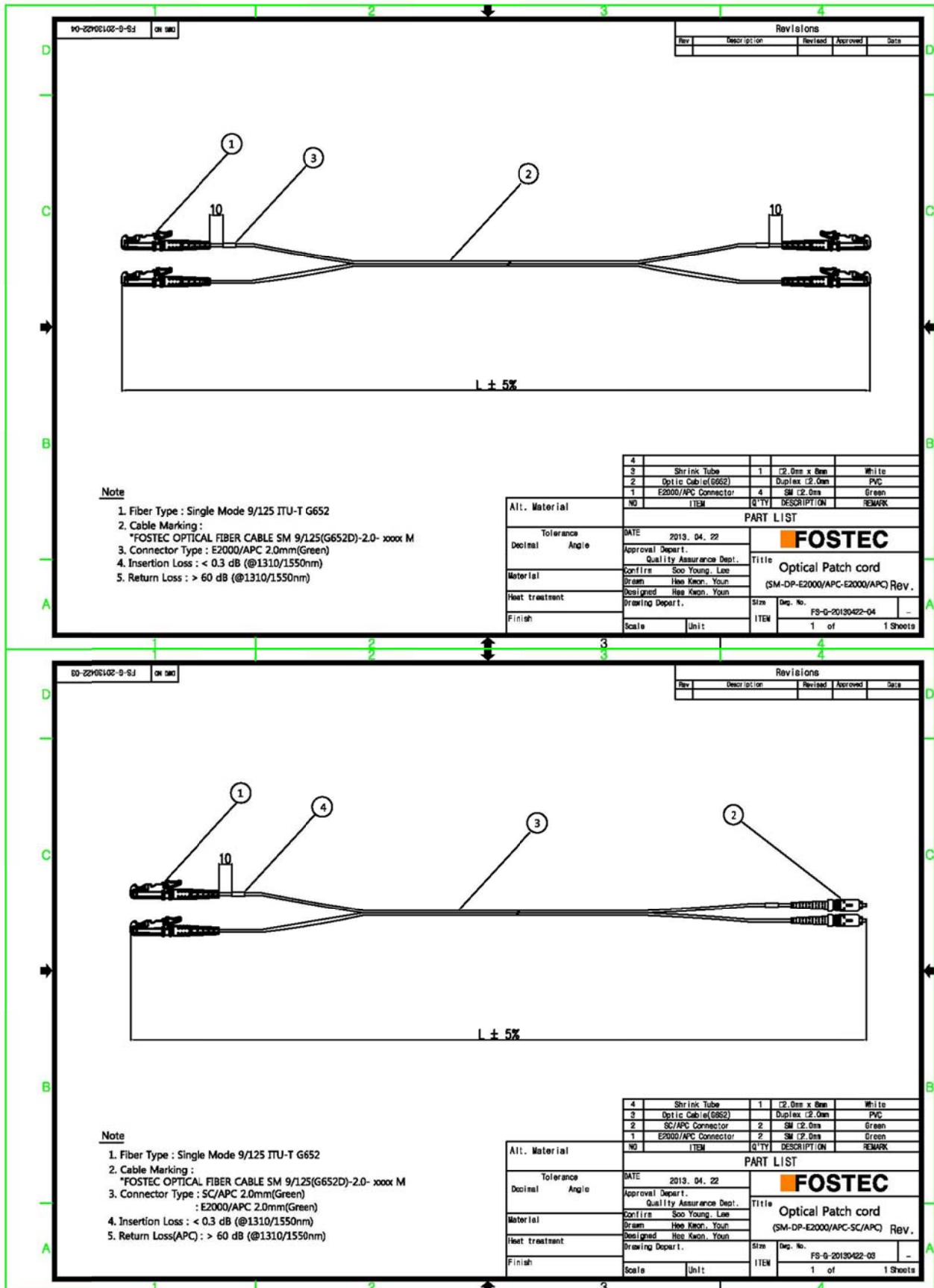
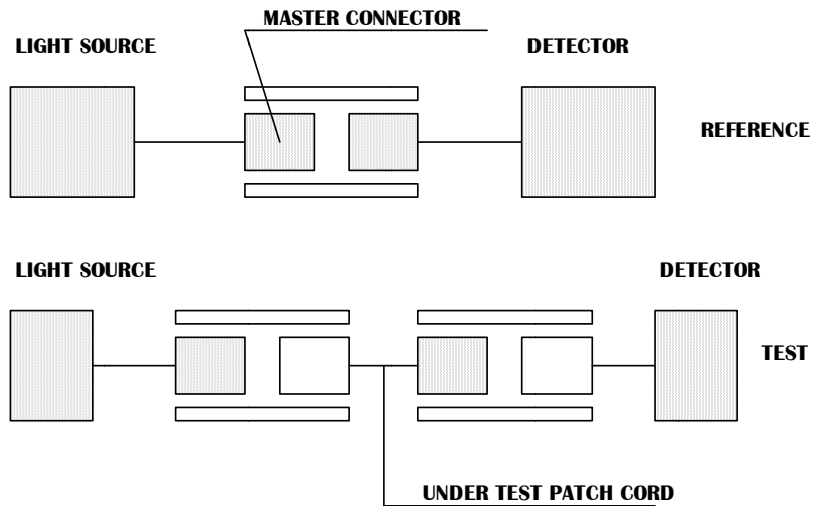


FIGURE 6. MEASUREMENT METHOD

1. INSERTION LOSS



2. RETURN LOSS

