Assembly Instruction for Fiber Optic Series
FOH
Fischer Connectors
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1 Introduction

This document covers:
- The application of Fischer FiberOptic Series electrical contacts and optical termini to electrical and fiber optic cables (singlemode and multimode fibers)
- The assembly of fiber optic cable with a cladding size of 125 \( \mu \text{m} \) and having the cable structure described in Fischer FiberOptic Series Cable Specifications
- The assembly of Fischer FiberOptic Series electrical contacts and optical termini and Rear Accessory sets (Wire, Cable Clamp and Potting sets) to Fischer FiberOptic Series Hybrid (referred as FOH in the present document)

Please read these instructions thoroughly before starting assembly.

2 Document history

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision #</th>
<th>Author</th>
<th>Controller</th>
<th>Modification description</th>
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</thead>
<tbody>
<tr>
<td>15.03.2017</td>
<td>6.0</td>
<td>JGY</td>
<td>SRH/CMI</td>
<td>New Document</td>
</tr>
<tr>
<td>06.04.2017</td>
<td>7.0</td>
<td>JGY</td>
<td>SRH/CMI</td>
<td>Adding instruction for electrical contact assembly §6</td>
</tr>
</tbody>
</table>

3 Definitions and Acronyms

<table>
<thead>
<tr>
<th>Text</th>
<th>Definition / Acronym</th>
</tr>
</thead>
<tbody>
<tr>
<td>FO</td>
<td>Fischer FiberOptic</td>
</tr>
<tr>
<td>FOH</td>
<td>Fischer FiberOptic Series Hybrid</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
</tr>
</tbody>
</table>
**Assembly steps**

<table>
<thead>
<tr>
<th>Components list :</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – Sleeve Holder</td>
</tr>
<tr>
<td>B – Connector Body</td>
</tr>
<tr>
<td>C – Insulator</td>
</tr>
<tr>
<td>D – Optical termini</td>
</tr>
<tr>
<td>E – Electrical termini</td>
</tr>
<tr>
<td>F – Support Washer</td>
</tr>
<tr>
<td>G – O-ring Seal</td>
</tr>
<tr>
<td>H – Potting Set Body</td>
</tr>
<tr>
<td>I – Crimping Sleeve</td>
</tr>
<tr>
<td>J – Rear Nut</td>
</tr>
<tr>
<td>K – Shrink Tube</td>
</tr>
<tr>
<td>L – Bend Relief</td>
</tr>
</tbody>
</table>

Note: the pictures shown in this section represent a P01 Plug.
The following assembly steps are valid for P01 plug, as well as R01, R03, R13 and R50 receptacles, except the final step (sleeve holder assembly).

### Assembly steps

<table>
<thead>
<tr>
<th>Picture</th>
<th>Process</th>
<th>Tools</th>
</tr>
</thead>
</table>
| ![Assembly steps](image) | Slide over the cable:  
- the Bend Relief “L”  
- the Shrink Tube “K”  
- Crimping sleeve“I”  
- the Rear Nut “J”  
- the Potting Set Body “P”  
- the O-Ring Seal “G” | Ruler, aramid shears, jacket stripper, and strip tool |
| ![Assembly steps](image) | Strip the cable to the dimensions as given on the picture. | |

Terminus assembly: see section 6

Polishing: see section 7
Insert all the termini “D” & “E” into the insulator “C”.

When you insert the terminus “D”, be careful to turn it during the insertion to not “bend” the contact O-ring.

Pin Layout front view.

Place the Support Washer “F” around the termini “D” & “E”.

Push the contact bloc (termini “D” & “E” + insulator “C”) with the Support Washer “F” until it clips.

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<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Position the O-Ring Seal “G” on the Potting Set Body “H” then slide the Potting Set Body “H” into the Connector Body “B”. Be careful to the orientation of the back body.</td>
</tr>
<tr>
<td>2</td>
<td>Screw by hand the Rear Nut “J” on the Connector Body “B”.</td>
</tr>
<tr>
<td>3</td>
<td>Screw the Rear Nut &quot;J&quot;. Recommended torque : 5.0 Nm. Torque wrench [5Nm] Size 16 Counter piece: receptacle FO2/4</td>
</tr>
<tr>
<td>4</td>
<td>Crimp the ground contact onto the Potting Set Body “H” using the crimping sleeve“I” . Find tools drawing in appendixes.</td>
</tr>
<tr>
<td>5</td>
<td>Slide the Shrink Tube &quot;K&quot; until the end of the shrink tube bottoms against the Potting Set Body “H” as shown on the left picture and heat it. Heat gun Shrink tube operating temperature Range : -55°C to 110°C..</td>
</tr>
<tr>
<td>Assembly instructions Rev 6.0</td>
<td>Slowly inject the epoxy inside the Potting Set Body “G” using the filling hole located at the bottom of the Potting Set Body “G”. Note: the second hole, smaller and located above the filling hole, is an overfilling hole. Stop injecting epoxy when epoxy starts to flow from this overfilling hole. Resin Epoxy RS 851-044 Black</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><img src="image1.png" alt="Injection Hole (2mm)" /> <img src="image2.png" alt="Overfill hole" /></td>
<td>Remove any excess epoxy from the assembly (if any), apply tape on both filling and overfilling holes and place the assembly onto the curing oven block. Curing time: 12 hours @ approx. 23°C.</td>
</tr>
<tr>
<td><img src="image3.png" alt="Injection Hole (2mm)" /> <img src="image4.png" alt="Overfill hole" /></td>
<td>Apply epoxy on the Shrink Tube &quot;K&quot; and slide the Bend Relief &quot;L&quot; until the end of the Bend Relief &quot;L&quot; bottoms against the Back Nut &quot;J&quot;. Epoxy: RT-355 Resintech</td>
</tr>
</tbody>
</table>
Insert Sleeve Holder "A" in the Connector Body "B".

Note: there is no sleeve holder for R01, R03, R13 and R50 receptacles. Thus, this final assembly step is valid only for P01 plug.
### Assembly steps

<table>
<thead>
<tr>
<th>Components list :</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – Connector Body</td>
</tr>
<tr>
<td>B – Insulator</td>
</tr>
<tr>
<td>C – Termini (Electric &amp; optic)</td>
</tr>
<tr>
<td>D – Support Washer</td>
</tr>
<tr>
<td>E – Crimp Sleeve</td>
</tr>
<tr>
<td>F – Shrink Tube</td>
</tr>
<tr>
<td>G – O-ring</td>
</tr>
<tr>
<td>H – Wire Set Body</td>
</tr>
<tr>
<td>I – Wire Set Nut</td>
</tr>
<tr>
<td>J – Connector Panel Seal</td>
</tr>
<tr>
<td>K – Connector Nut</td>
</tr>
</tbody>
</table>

#### Assembly instructions

**5  FOH R01, R03 & R13 Receptacles with Wire Set**

<table>
<thead>
<tr>
<th>Picture</th>
<th>Process</th>
<th>Tools</th>
</tr>
</thead>
</table>
| ![Picture](image1.png) | Slide over the cable :  
- the Wire Set Nut “I”  
- the Wire Set Body “H”  
- The O-ring “G”  
- the Shrink Tube “F”  
- the Crimp Sleeve “E” | Ruler, aramid shears, jacket stripper, and strip tool |

<table>
<thead>
<tr>
<th>Picture</th>
<th>Process</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image2.png" alt="Picture" /></td>
<td>Strip the cable to the dimensions as given on the picture.</td>
<td></td>
</tr>
</tbody>
</table>

**Terminus assembly : see section 6**

<table>
<thead>
<tr>
<th>Picture</th>
<th>Process</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Picture" /></td>
<td>Uniformly distribute the cable strength members around the back of the Terminus “B”.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Picture</th>
<th>Process</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4.png" alt="Picture" /></td>
<td>Slide the Crimp Sleeve “E” over the cable strength members until the end of the crimp sleeve bottoms against the Terminus “B”.</td>
<td>Find tools drawing in appendixes.</td>
</tr>
<tr>
<td>Picture</td>
<td>Process</td>
<td>Tools</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td>Slide the Shrink Tube “F” over the Crimping Sleeve “E” and heat it.</td>
<td>Heat gun</td>
</tr>
</tbody>
</table>

**Polishing: see section 7**

<table>
<thead>
<tr>
<th>Picture</th>
<th>Process</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image2.png" alt="Image" /></td>
<td>Insert all the termini “C” into the insulator “B”. When you insert the terminus “C”, be careful to turn it during the insertion to not “bend” the contact O-ring.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Receptacle</th>
<th>Pin Layout front view.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Receptacle Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Picture</th>
<th>Process</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4.png" alt="Image" /></td>
<td>Place the Support Washer “D” around the termini “C”.</td>
<td></td>
</tr>
</tbody>
</table>

| Pin Layout front view. | |
|------------------------| |
| ![Receptacle Diagram](image5.png) | |

<table>
<thead>
<tr>
<th>Picture</th>
<th>Process</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image6.png" alt="Image" /></td>
<td>Push the contact bloc (termini “C” + insulator “B”) with the Support Washer”.</td>
<td></td>
</tr>
</tbody>
</table>

| Receptacle | |
|------------| |
| ![Receptacle Diagram](image7.png) | |

<table>
<thead>
<tr>
<th>Picture</th>
<th>Process</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image8.png" alt="Image" /></td>
<td>Insert the Wire Set Body “H” into the Connector Body “A”.</td>
<td></td>
</tr>
<tr>
<td>Picture</td>
<td>Process</td>
<td>Tools</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td><img src="image1.png" alt="Picture" /></td>
<td>Screw the Wire Set Nut “I” on the Connector Body “A”. Recommended torque: 5.0 Nm</td>
<td>Torque wrench [5Nm] <strong>Size 16</strong></td>
</tr>
</tbody>
</table>

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# 6 Terminus assembly

## Assembly steps

<table>
<thead>
<tr>
<th>Components list</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A – Housing O-Ring</td>
<td></td>
</tr>
<tr>
<td>B – Termini Housing</td>
<td></td>
</tr>
<tr>
<td>C – Ferrule O-Ring</td>
<td></td>
</tr>
<tr>
<td>D – Ferrule</td>
<td></td>
</tr>
<tr>
<td>E – Spring</td>
<td></td>
</tr>
<tr>
<td>F – Termini Closure</td>
<td></td>
</tr>
</tbody>
</table>

## Components list:

| A – Housing O-Ring       |  |
| B – Termini Housing      |  |
| C – Ferrule O-Ring       |  |
| D – Ferrule              |  |
| E – Spring               |  |
| F – Termini Closure      |  |

### Picture

<table>
<thead>
<tr>
<th>Picture</th>
<th>Process</th>
<th>Tools</th>
</tr>
</thead>
</table>
| ![Picture](image1.png) | Slide over the cable:  
- the Termini Closure “F”  
- the Spring “E” | |
| ![Picture](image2.png) | Prepare the cable according to stripping dimension from the relevant section.  
Insert epoxy into the Ferrule “D” until a little drop appears at the ferrule end.  
Carefully insert the fiber into the back of the Ferrule “D” and make sure the buffer slides inside the ferrule the buffer bottoms on the ceramic. | Extended Working Life, 2-Part Epoxy, 2.5 Gram Packet  
Fr s : FIBER OPTIC CENTER  
Ref : ET383ND-2.5G |
| ![Picture](image3.png) | Remove any excess epoxy from the assembly | |
| ![Picture](image4.png) | Cure the epoxy | 120 +10/- 20[^C] during 20 min. |
| ![Picture](image5.png) | Cleave fiber | Scribe Tool |

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Position the Ferrule O-ring “C” on the Ferrule “D” as shown on the top left picture.

Slide the Spring “E” and Termini Closure “F” at the back of the Ferrule “D” and assemble them into the Termini Housing “B”.

Position the Housing O-ring “A” on the Termini Housing “B” as shown on the left picture.

**Solder contact**

Solder the wire to the contact
7 Polishing

It is recommended polishing the fiber using a polishing machine. Polish the fiber according to the machine manufacturer’s instructions.

<table>
<thead>
<tr>
<th>Picture</th>
<th>Process</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><strong>Step 1: Air polish</strong>&lt;br&gt;Holding the polishing bushing and terminus, place the polishing bushing on the film. Using light pressure on the ferrule, polish the endface of the ferrule in a small circular motion.</td>
<td>• Polishing film: 9µm Silicon carbide&lt;br&gt;• Polishing Pad: N/A&lt;br&gt;• Lubricant: N/A&lt;br&gt;• Tool: FO-10090</td>
</tr>
<tr>
<td><img src="image2.png" alt="Image" /></td>
<td>Clean the polishing pad with demineralized water and lint-free cloth, from the center outwards.</td>
<td></td>
</tr>
<tr>
<td><img src="image3.png" alt="Image" /></td>
<td>Spray some demineralized water on the polishing pad and place the polishing film, starting at edges of the polishing pad.</td>
<td></td>
</tr>
<tr>
<td><img src="image4.png" alt="Image" /></td>
<td>Spray abundantly demineralized water on the polishing film.</td>
<td></td>
</tr>
</tbody>
</table>
### Step 2:

Polish the termini with 5µm Silicon carbide polishing film, until no peripheral chips are visible.

**Do not remove more than 100 µm.**

- **Polishing film:** 5µm Silicon carbide
- **Polishing Pad:** 90 duro black
- **Lubricant:** DI-water
- **Fixture tool:** FO-10019

Wipe abundantly the polishing tool holding the termini with demineralized water and clean it carefully with a lint-free cloth.

Use an airpressure gun to remove residual water.

Clean the polishing pad with demineralized water and lint-free cloth, from the center outwards.

Spray some demineralized water on the polishing pad and place the polishing film, starting at edges of the polishing pad.

Spray abundantly demineralized water on the polishing film.

### Step 3:

Polish the termini with 1µm Diamond polishing film in an 8 pattern motion (or pattern of the polishing machine).

- **Polishing film:** 1µm Diamond
- **Polishing Pad:** 80 duro green
- **Lubricant:** DI-water
- **Fixture tool:** FO-10019
<table>
<thead>
<tr>
<th>Step 4:</th>
<th></th>
</tr>
</thead>
</table>
| Polish the termini with AngstromLap Final Polish SiO2 in an 8 pattern motion. | ▪ Polishing film: AngstromLap Final Polish SiO2  
▪ Polishing Pad: 80 duro green  
▪ Lubricant: DI-water  
▪ Fixture tool: FO-10019 |
| Do not clean the polishing tool after this step, to avoid creating scratches on the polished ferrule. |  |
**Geometrical control:**

- **Ferrule Radius [mm]:**
  - Min 5 - Max 12

- **Apex Offset [μm]:**
  - Min 0.0 – Max 50.0

  If fail, repeat from step 3.

**Fiber core inspection:**

Examine the endface of the ferrule for scratches according to left pictures.

If fail, repeat from step 4.

**If not installing the connector immediately, install a protective cover onto terminus to prevent contamination to the endface of the ferrule.**

### 8° APC termini

#### Step 1: Air polish

Holding the polishing bushing and terminus, place the polishing bushing on the film.

Using light pressure on the ferrule, polish the endface of the ferrule in a small circular motion.

- Polishing film: 9μm Silicon carbide
- Polishing Pad: N/A
- Lubricant: N/A
- Tool: FO-10090
## Assembly instructions Rev 6.0

| Step 2: | Polishing film: 5µm Diamond  
|         | Polishing Pad: Glass  
|         | Lubricant: DI-water  
|         | Fixture tool: TX00.285  |

### Step 2:
Polish the termini with 8° angle using the fixture tool.

Make sure the endface of the ferrule is fully polished, as shown on the left pictures.

If not, repeat from step 2.

- **Polishing film**: 5µm Diamond
- **Polishing Pad**: Glass
- **Lubricant**: DI-water
- **Fixture tool**: TX00.285

<table>
<thead>
<tr>
<th>OK</th>
<th>NOK</th>
</tr>
</thead>
</table>

Wipe abundantly the polishing tool holding the termini with demineralized water and clean it carefully with a lint-free cloth.

Use an airpressure gun to remove residual water.

Clean the polishing pad with demineralized water and lint-free cloth, from the center outwards.

Spray some demineralized water on the polishing pad and place the polishing film, starting at edges of the polishing pad.

Spray abundantly demineralized water on the polishing film.

Wipe abundantly the polishing tool holding the termini with demineralized water and clean it carefully with a lint-free cloth.

Use an airpressure gun to remove residual water.
### Step 3:

Polish the termini with 1µm Diamond polishing film in an 8 pattern motion (or pattern of the polishing machine).

- Polishing film: 1µm Diamond
- Polishing Pad: 80 duro green
- Lubricant: DI-water
- Fixture tool: TX00.285

### Instructions:

1. Clean the polishing pad with demineralized water and lint-free cloth, from the center outwards.
2. Spray some demineralized water on the polishing pad and place the polishing film, starting at edges of the polishing pad.
4. Wipe abundantly the polishing tool holding the termini with demineralized water and clean it carefully with a lint-free cloth.
5. Use an airpressure gun to remove residual water.
Clean the polishing pad with demineralized water and lint-free cloth, from the center outwards.

Spray some demineralized water on the polishing pad and place the polishing film, starting at edges of the polishing pad.

Spray abundantly demineralized water on the polishing film.

| Step 4: | Polishing film: AngstromLap Final Polish  
| - | Polishing Pad:80 duro green  
| - | Lubricant: DI-water  
| - | Fixture tool: TX00.285 |

Polish the termini with AngstromLap Final Polish SiO2 in an 8 pattern motion.

Do not clean the polishing tool after this step, to avoid creating scratches on the polished ferrule.

**Geometrical control:**

**Ferrule Radius[mm]:**
Min 5 - Max 12

**Apex Offset[um]:**
Min 0.0 – Max 50.0

If fail, repeat from step 3.

**Fiber core inspection:**

Examine the endface of the ferrule for scratches according to left pictures.

If fail, repeat from step 4.

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<table>
<thead>
<tr>
<th>Assembly instructions Rev 6.0</th>
<th>If not installing the connector immediately, install a protective cover onto terminus to prevent contamination to the endface of the ferrule.</th>
</tr>
</thead>
</table>

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8 Appendix

Tool drawing for crimping the sleeve to the contact
Assembly instructions Rev 6.0

Tool drawing for crimping the ground contact to the rear body (FOH)