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**FullAXS CABLE ASSEMBLY**  
**Fiber Optic SM – IP65 Performance**

**1. SCOPE.**

FullAXS is a compact, IP65 sealed connector system which allows an SFP transceiver to be changed without breaking the major seal of a cabinet.

This specification gives an overview of all relevant specifications or requirements related to duplex LC SM FullAXS Cable Assemblies and EMI tube assembly which is installed on the FullAXS Connector.

**1.1. Content.**

This specification covers performance, test and quality requirements for the TE\* FullAXS Connector, the LC Connector, the EMI tube assembly and the Cable related to the following FullAXS Fiber Optic Cable Assemblies:

- Cable Assembly; FullAXS duplex LC to LC duplex, single mode

Requirements directly related to the above mentioned Cable Assemblies and not covered within the list of Specifications, are explicitly specified in this document.

**1.2. Qualification.**

All components for the cable assembly, connectors, over-mould and cable were subject to their individual design objectives and were qualified accordingly.

This document addresses the total cable assembly and the EMI tube assembly.

When tests are performed on subject product, procedures specified in this specification shall be used. All inspections shall be performed using applicable inspection plan and product drawings.

**2. APPLICABLE DOCUMENTS.**

The following documents form a part of this specification to the specified herein.

Unless otherwise specified, latest edition of the document applies.

In the event of conflict between the requirements in this specification and the product drawing, the product drawing shall take precedence.

In the event of conflict between requirements of this specification and referenced documents, this specification shall take precedence.

**2.1. TE Connectivity Documents.**

|           |                                                                                    |
|-----------|------------------------------------------------------------------------------------|
| 108-19436 | Product Specification; FullAXS Cable Plug - Shielded and Unshielded Connection     |
| 501-76090 | Qualification Test report; FullAXS Cable Plug - Shielded and Unshielded Connection |
| 501-76086 | Qualification Test report; FullAXS Cable Assembly 2061432                          |
| 501-652   | Qualification Test report; Single mode LC connector conform GR-326                 |
| 501-32035 | Qualification Test report; EMI tube assembly 2833010                               |
| 114-32032 | Application Specification; FullAXS Connector System                                |
| 2061502   | Cable drawing 2-fold single mode outdoor FO cable, Kevlar yarns                    |
| 2061700   | Cable drawing 2-fold single mode outdoor FO cable, Glass Roving yarns              |
| 107-19517 | FullAXS Packaging Procedure                                                        |

## 2.2. Other Documents

|             |                                                              |
|-------------|--------------------------------------------------------------|
| IEC 61300   | Series test and measurement methods.                         |
| IEC 60529   | Degrees of protection provided by enclosures (IP Code)       |
| IEC 60068-1 | Environmental testing Part 1: General and Guidance           |
| IEC 60512-1 | Connectors for Electronic Equipment - Tests and Measurements |

## 3. REQUIREMENTS.

### 3.1. Design and Construction.

Products shall be of design, construction, performance and physical dimensions as specified on the applicable product drawings as found in paragraph 2.1.

### 3.2. Material and Finish.

|                                     |                                                        |
|-------------------------------------|--------------------------------------------------------|
| Fiber Optic Cable, 2 Fold           | - Thermoplastic, Flame Retardant, Halogen Free, Black. |
| Overmoulded Drop Protection         | - PA, Black                                            |
| Overmoulded LC Duplex Plug Assembly |                                                        |
| Plug Protection Cap                 | - Glass Filled PPS, UL 94 V-0, Black                   |
| Protection Cap Seal                 | - Silicone rubber, Black                               |
| Cap Strap Assembly                  |                                                        |
| Nylon Cord                          | - PA, UL 94 V-0, Black                                 |
| Ferrule                             | - Sn Plated Cu                                         |
| FullAXS Inner body                  | - PA, UL 94 V-0, Black                                 |
| FullAXS Wave spring                 | - Stainless Steel                                      |
| FullAXS O-ring                      | - EPDM Rubber (silicone coated), Black                 |
| FullAXS Bayonet Shell               | - Glass Filled PPS, UL 94 V-0, Black                   |
| Overmould                           | - PA, Black                                            |
| Overmould O-ring                    | - EPDM Rubber (silicone coated), Black                 |
| LC Connector Assembly               |                                                        |
| Dustcover                           | - TPE, UL 94 V-0, Black                                |
| Ferrule Sub Assembly                | - Zirconia/Metal                                       |
| Compression Spring                  | - Stainless Steel                                      |
| Housing                             | - PEI, Blue                                            |
| Inner Tubing                        | - PTFE, Clear, UL VW-1                                 |
| Rear Body                           | - Aluminium                                            |
| Duplex Clip                         | - PC Blend, UL 94 V-0, Black                           |
| Heat Shrink Tubing                  | - Polyolefin, Flame Retardant, Black / Yellow          |
| Protective Tubing                   | - TPU, Flame Retardant, Black                          |
| Limiting Bending Boot               | - PP, UL 94 V-0, Blue                                  |
| EMI tube Assembly                   |                                                        |
| EMI tube                            | -BRASS(CuZn33), Plating CuSnZn 55/25/20                |
| Protection ring                     | - Glass Filled PBT, Black                              |

### 3.3. Environment condition.

- A. Operating temperature: – 40°C to +70°C.
- B. Storage temperature: – 25°C to +70°C.
- C. Installation (assembly): – 15°C to +60°C.
- D. Protection Rating: IP65; Mated to bulkhead as well as Plug protection cap.

### 3.4. Performance and Test description.

The product is designed to meet optical, mechanical and environmental performance specified in this paragraph as tested per test sequence specified in paragraph 3.6.

Unless otherwise specified, all tests are performed at ambient environmental conditions per IEC specification 60068-1 clause 5.3. Tests are performed with the complete Cable Assembly in mated and fixed condition.

| V I S U A L |                                           |                                                                                                                                      |                                                                                                          |
|-------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Para        | Test Title                                | Performance / Severity Requirements                                                                                                  | Procedure                                                                                                |
| 3.4.1.      | Examination of product (cable assemblies) | Meets requirements of product-drawing and applicable instructions on customer drawing, instruction sheet, application specification. | Visual, dimensional and functional per applicable inspection plan.<br>IEC 60512-1-1<br>Magnification 10x |

| M E C H A N I C A L |            |                                     |           |
|---------------------|------------|-------------------------------------|-----------|
| Para                | Test Title | Performance / Severity Requirements | Procedure |

|         |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                  |
|---------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| 3.4.2.  | Storage on primary packaging ( shipping box)                            | Thermal shock – 25°C to +70°C<br>1 cycle 12 hrs / 12 hrs. Transition time 3 hrs                                                                                                                                                                                                                                                                                                                       | IEC 60512-6                                                      |
| 3.4.3.  | Free Fall                                                               | Free Fall: Primary packaged product;<br>10 drops from 1.5m height on concrete floor.                                                                                                                                                                                                                                                                                                                  | IEC 61300-2-12<br>Method B                                       |
| 3.4.4.  | Temperature cycling                                                     | -40°C to +70°C.<br>Dwell time @ -40°C and +70°C: 3h<br>-40°C to +70°C.<br>Dwell time @ -40°C and +70°C: 1.5h<br>12 cycles<br>Cable coiled loosely,<br>diameter ≥ 600mm / ≥ 300mm<br>AttLA: During test, ≤ 0.5 dB.<br>After test, ≤ 0.4 dB<br>BR: Final test, ≥ 50 dB                                                                                                                                  | IEC 61300-2-22                                                   |
| 3.4.5.  | Ferrule compression force                                               | 5 – 9 N. (Initial)                                                                                                                                                                                                                                                                                                                                                                                    | IEC 61300-3-22                                                   |
| 3.4.6.  | Torsion                                                                 | Min. 15N straight, 25 cycles ± 180°<br>0.5 meter from connector<br>AttLA: During and after, ≤ 0.4 dB                                                                                                                                                                                                                                                                                                  | IEC 61300-2-5                                                    |
| 3.4.7.  | Fibre/Cable retention                                                   | <b>LC-end:</b> Min. 50N straight pull, during 120s<br><b>FULLAXS-end:</b><br>Min. F1= 100N straight. During 120s<br>Min. F2= 50N 90° at direction 0° from axis.<br>During 120s<br>Min. F2=50N 90° at direction 90° from axis.<br>During 120s<br>Centre line through the two bayonet pins of the<br>bulkhead. 0.3 meter from connector<br>AttLA: During and after, ≤ 0.4 dB<br>BR: Final test, ≥ 50 dB | In acc. with<br>IEC 61300-2-4<br>“See also paragraph.<br>3.5.1.” |
| 3.4.8.  | Water Immersion                                                         | Parts inside tested combinations shall show<br>no signs of water intrusion.                                                                                                                                                                                                                                                                                                                           | In acc. With<br>IEC 60529 IP-X5                                  |
| 3.4.9.  | Mating force/Unmating force<br>(EMI tube and inner body to<br>bulkhead) | Measure force to engage and separate shield<br>and inner-body into bulkhead.<br>Requirements:<br>Mating force/Unmating force: 80N max.                                                                                                                                                                                                                                                                | In acc. with<br>IEC 60512-13-2                                   |
| 3.4.10. | EMI tube retention                                                      | Pull-out force of the EMI Tube vs Inner body: Min.<br>80N                                                                                                                                                                                                                                                                                                                                             | In acc. with<br>IEC 60512-17-3                                   |

| <b>ELECTRICAL</b><br><i>For the EMI tube Assembly</i> |                         |                                                                                                 |                                |
|-------------------------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------|--------------------------------|
| Para                                                  | Test Title              | Performance / Severity<br>Requirements                                                          | Procedure                      |
| 3.4.11.                                               | Shielding effectiveness | Box leakage: 20dB min. at 2-4 GHz.<br>FO module with loopback, 10Gb/s: 10dB<br>min. at 2-4 GHz. | In acc. with<br>IEC 60512-23-1 |

### 3.5. Additional testing details.

#### 3.5.1. Fibre/Cable retention tests.

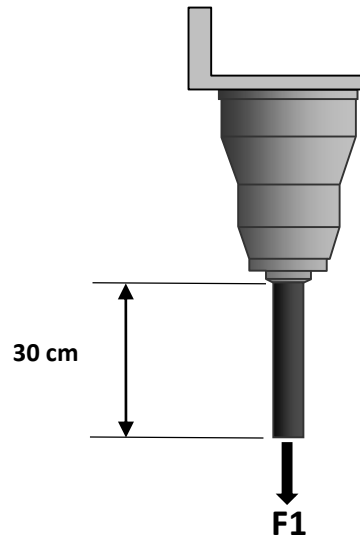


Figure 1: Straight pull

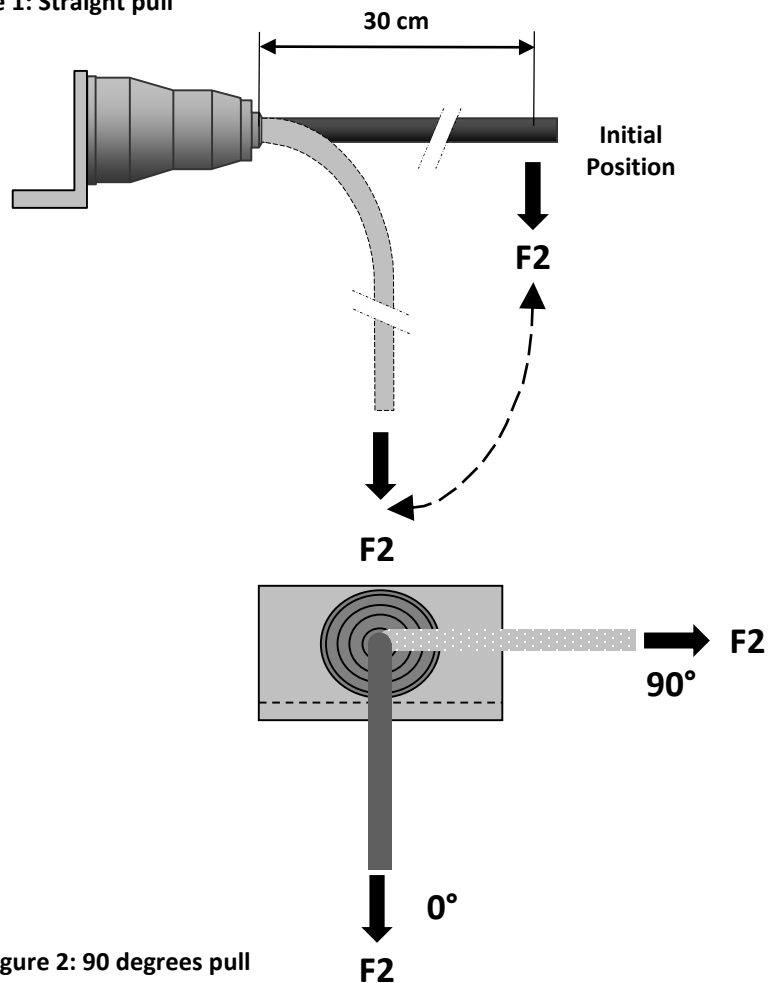


Figure 2: 90 degrees pull

### 3.6. Product Qualification and Requalification Test Sequence.

#### 3.6.1 Cable assembly.

| Test or examination<br>Un-shielded cable assemblies | TEST-GROUP (a)    |   |   |  |  |
|-----------------------------------------------------|-------------------|---|---|--|--|
|                                                     | 1                 | 2 | 3 |  |  |
|                                                     | TEST-SEQUENCE (b) |   |   |  |  |
| Storage (in primary packaging)                      | 1                 |   |   |  |  |
| Free Fall (in primary packaging)                    | 2                 |   |   |  |  |
| Examination of Product                              | 3, 15             |   |   |  |  |
| Fibre/Cable retention, Straight                     | 5, 10             |   |   |  |  |
| Fibre/Cable retention, Side                         | 6, 11             |   |   |  |  |
| Torsion                                             | 7, 12             |   |   |  |  |
| Ferrule compression force                           | 8, 13             |   |   |  |  |
| Temperature cycling                                 | 9                 |   |   |  |  |
| Water Immersion (IP65)                              | 4, 14             |   |   |  |  |

| Survey Of Sample In Test-groups                                          |                                                  |   |   |  |  |
|--------------------------------------------------------------------------|--------------------------------------------------|---|---|--|--|
| Sample description                                                       | Number Of Samples<br>To Be Tested In Test-groups |   |   |  |  |
|                                                                          | 1                                                | 2 | 3 |  |  |
| Test frame panel                                                         | 1                                                |   |   |  |  |
| Cable assemblies FO in primary packaging (shipping box) for step 1 and 2 | 5 pcs. from one box                              |   |   |  |  |

- (a) See paragraph 4.1.  
(b) Numbers indicate sequence in which tests are performed.

#### 3.6.2 EMI tube assembly.

| Test or examination<br>EMI tube assemblies | TEST-GROUP (a)    |     |   |  |  |
|--------------------------------------------|-------------------|-----|---|--|--|
|                                            | 1                 | 2   | 3 |  |  |
|                                            | TEST-SEQUENCE (b) |     |   |  |  |
| Examination of Product                     | 1,4               | 1,3 |   |  |  |
| Mating force/Unmating force                | 2                 |     |   |  |  |
| EMI tube retention                         | 3                 |     |   |  |  |
| Shielding effectiveness                    |                   | 2   |   |  |  |

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| Survey Of Sample In Test-groups           |                                                  |   |   |  |  |
|-------------------------------------------|--------------------------------------------------|---|---|--|--|
| Sample description                        | Number Of Samples<br>To Be Tested In Test-groups |   |   |  |  |
|                                           | 1                                                | 2 | 3 |  |  |
| EMI tube assembly+ Bulkhead+inner<br>body | 5                                                |   |   |  |  |
| EMI tube assembly                         |                                                  | 2 |   |  |  |

#### **4. QUALITY ASSURANCE PROVISIONS.**

##### **4.1. Qualification testing.**

###### **A. Sample selection**

Samples shall be prepared in accordance with applicable instructions and shall be selected at random from current production.  
All test-groups shall consist of a minimum of 5 cable assemblies.

###### **B. Test sequence**

Qualification inspection shall be verified by testing samples as specified in paragraph. 3.6.

##### **4.2. Re-qualification testing.**

If changes significantly affecting form, fit or function are made to product or manufacturing process, product assurance shall coordinate re-qualification testing, consisting of all or part of original testing sequence as determined by product, quality and reliability engineering.

##### **4.3. Acceptance.**

Acceptance is based upon verification that product meets requirements of paragraph 3.4. Failures attributed to equipment, test set-up, applied customer components or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for re-qualification. Testing to confirm corrective action is required before re-submittal.

##### **4.4. Quality conformance inspection.**

Applicable TE quality inspection plan will specify sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with applicable product drawing and this specification.

Compliance information regarding EU RoHS/ELV, China RoHS, REACH SvHC and Halogen content about the products can be found at <http://www.te.com/commerce/alt/product-compliance.do>