New Fiber Connection Quality Requirements in TIA-568C

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Agenda

• Overview of TIA-568-C
• Connector Quality
• What is IEC 61300-3-35
• Inspect Before You Connect
• How & where is IEC 61300-3-35 used
• Tools to comply with TIA-568-C
• Objective vs. Subjective inspection
• Summary
Overview: TIA-568-C.0

- “The foundation for premises telecommunications cabling infrastructure”
- Includes cabling transmission performance and test requirements for BOTH twisted-pair and Optical Fiber
- Includes test guidelines that are described in an informative annex
- Next release is scheduled for release later this year
568-C and Connector Quality

The test procedures specified by 568-C require tools and procedures for ensuring connector quality

• End faces on test cords shall be accordance to IEC 6100-3-35
• Use a microscope that is compatible with IEC 61300-3-35
• The microscope must use adapters that are compatible with connectors

• TIA-526-14-B
  Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant

• TIA-526-7
  Optical Power Loss Measurements of Installed Single-Mode Fiber Cable Plant
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- **TIA-526-14-B**
  The ends of the cabling shall be free of contamination (e.g. dirt and dust) in accordance with IEC 61300-3-35. If contamination is seen, the connector end face shall be cleaned using the equipment and methods of 5.6.

- **TIA-526-7**
  The ends of the test cords shall be free of dirt or dust and shall be scratch free in accordance with IEC 61300-3-35. If contamination is seen, clean using the equipment and methods of 5.7.
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• End faces on test cords shall be accordance to IEC 6100-3-35
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5.7 Connector end-face cleaning and inspection equipment

Cleaning equipment (including apparatus, materials, and substances) and the methods to be used shall be suitable for the connectors to be cleaned. Connector suppliers’ instructions shall be consulted where doubt exists as to the suitability of particular equipment and cleaning methods.

A microscope compatible with IEC 61300-3-35, low resolution method, is required to verify that the fibre and connector end faces of the test cords are clean and free of damage. Microscopes with adaptors that are compatible with the connectors used are required.
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The next update of 568-C will include explicit details about the inspection requirements in Annex E (testing)
What is IEC 61300-3-35?

- A set of requirements for Fiber Optic connector quality
- Designed to guarantee insertion loss and return loss performance
- Used as a common reference between supplier & customer or between work groups
- Used as a condition for accurate testing of components or links
IEC 61300-3-35 Acceptance Criteria

- These criteria are designed to guarantee a common level of performance
- Separate criteria for different connector types
  - SM-UPC (RL > 45dB)
  - SM-APC
  - SM-PC (RL > 26dB)
  - MM
  - Multi-fiber

Example of Pass/Fail Criteria (SM-UPC)

<table>
<thead>
<tr>
<th>ZONE NAME</th>
<th>SCRATCHES</th>
<th>DEFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. CORE (0–25μm)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>B. CLADDING (25–120μm)</td>
<td>No limit &lt;= 3μm</td>
<td>No limit &lt; 2μm</td>
</tr>
<tr>
<td></td>
<td>None &gt; 3μm</td>
<td>5 from 2–5 μm</td>
</tr>
<tr>
<td></td>
<td>None &gt; 5μm</td>
<td></td>
</tr>
<tr>
<td>C. ADHESIVE (120–130μm)</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>D. CONTACT (130–250μm)</td>
<td>No limit</td>
<td>None =&gt; 10μm</td>
</tr>
</tbody>
</table>
IEC 61300-3-35 requires inspection of optical connectors

- The connector cannot recover from scratches
- The connector may recover from defects
Inspect Before You Connect!

- IEC 61300-3-35 strongly reinforces IBYC
If the Connector Fails for Defects, Clean it

- 61300-3-35 requires an attempt to clean before failing
  - “If the fiber fails inspection for defects, the user shall clean the fiber and repeat the inspection process.”
- Rejecting product without cleaning is counterproductive
- Use designed-for-optics cleaning tools to avoid damaging the connector
- If IBYC has been practiced throughout the product lifecycle, the defects will clean off easily
Why Did the IEC Create 61300-3-35?

• Companies throughout the component lifecycle were experiencing significant pain from dirty & damaged connectors

• The need for higher quality components and better performing networks moving forward

• Establish a standard method for proper testing
  – Better test results
  – Prevent damage to the product or network during test
How is IEC 61300-3-35 used?

• As a requirement from the customer to the supplier
  – Integrator to component supplier
  – Operator to contractor

• As a guarantee of product quality & performance from the supplier to the customer
  – Manufacturer to consumer
  – OEM to service provider
  – Between work groups

• As a guarantee of network quality & performance within an organization

• As a guarantee of connector condition for acceptable testing of the component or link
Where is IEC 61300-3-35 Used?

Throughout the Entire FO Product Lifecycle
Where is IEC-61300-3-35 Referenced?

- **TIA-568-C.0**
  - Referenced in test procedures
- **TIA-526-7 / IEC 61280-4-1**
  - Insertion loss testing of multimode fiber optic cabling
- **TIA-526-14B / IEC 61280-4-2**
  - Insertion and return loss testing of singlemode fiber optic cabling
- **ISO/IEC 11801**
  - References ISO/IEC 14763-3 for all fiber testing
- **ISO/IEC 14763-3**
  - Testing fiber optic cabling in premises networks
- **IEC 61280-4-4 Ed.2**
  - PMD testing of installed fiber optic cabling
- **IEC 61757-1**
  - International Standard for fiber optic sensors
- **ITU-T G.650.3**
  - ITU Recommendation for fiber characterization
- **Purchasing specifications & work instructions**
Why Should I care? (Business Impact)

Product or Service Suppliers
• Verifying endface condition ensures repeatable product quality
• Documenting endface quality assures customer satisfaction and protects the supplier

Network Owners
• Compliance to 61300-3-35 provides a guarantee of network condition and performance
• Build the network for a lifetime of performance
  – Be prepared for unknown future customer needs
  – DON’T infect the network with problems we will have to deal with later
• Lower maintenance costs / opex
  – Achieve expected ROI
How do I Implement IEC 16300-3-35?

- Establish Inspect Before You Connect as a best practice within your organization
- Expect your suppliers to meet the requirements of the standard
  - Products you purchase should meet this specification
  - Work done to your network should meet these process requirements (IBYC)
- Compliance to 61300-3-35 provides a guarantee of network condition and performance
Inspection Tools: Video Microscopes

• **Probe Microscope**
  – Used with handheld video displays
  – Can inspect BOTH ends of a connection
    • *Patch Cord & Bulkhead*
  – Can inspect various connector types
    • *Single Fiber (SC, LC, MU, E2000, etc.)*
    • *Multi-Fiber (MTP, MPO, OptiTip™)*
  – Application: Both Field & Lab

• **Benchtop Scope**
  – Used with benchtop video display
  – Application: Lab & Manufacturing
Choosing the Right Tools Will Impact Performance

• Tools designed for workflow improve technician performance
  – **Efficiency:** Do more in less time
  – **Reliability:** Drives techs to follow correct procedures
  – **Repeatability:** Easy, repeatable process

• **New Techs follow best practices from Day 1**
  – Prevent techs from developing bad habits
  – New fiber links install smoothly
  – Prevent unnecessary troubleshooting

▪ **When your Techs work smarter – You save money!**
  – Time = Money
  – Protecting your network investment
  – Achieve better network performance
Objective Inspection vs. Subjective Inspection

- **Subjective Inspection**
  - Many Factors impact results:
    - Display settings
    - Ambient lighting
    - Operator eyesight
    - Operator judgment
  - Actually testing is very difficult
  - Certification is not practical

- **Objective Inspection**
  - Eliminates variation in results
  - Certifies and records product quality
  - All skill levels can certify quality
  - Makes advanced criteria simple
  - Improves performance & yields
Objective Inspection Impact on FO Market

- Objective inspection tools have been key to adoption of standardized inspection methods and criteria
  - Inspect Before You Connect education
  - IEC 61300-3-35, TIA-568-C
  - Objective Inspection Tools
- Objective inspection tools were used to develop the IEC standard
- The combination of common requirements (IEC) and objective measurement have impacted product quality through the entire supply chain
- Common, repeatable systems provide correlation through the supply chain
- Adaptable systems enable custom requirements
Acceptable fiber endface conditions are a requirement for meeting TIA-568-C

568-C requirements reference IEC 61300-3-35 for the pass/fail specifications for endface quality

Compliance to the standard guarantees component and network performance and certifies the quality of the work

Compliance to the standard will ensure your network is ready for whatever speed or application requirements come next

A JDSU White Paper on IEC 61300-3-35 will be sent to all attendees
Where Can I Find the Standards?

- Copies of the standard can be purchased from ANSI or your country’s standards body
  - www.ANSI.org
    - IEC: Search for “61300-3-35”
    - TIA: Search for “568-C”
  - www.tiaonline.org
FiberChekPRO is the industry standard connector inspection & analysis program. It provides objective and repeatable certification for fiber optic end-face quality.

- Inspect and certify fiber end faces as the push of a button.
- Simple PASS/FAIL acceptance testing
- Certifies compliance IEC 61300-3-35 or customer specific standards
- Proven track record of success: 8+ years of use and development
- Use spans the entire FO industry
Questions?

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