

Technical Note

Excel Excelerator Fibre Pre-terminated Quality Control Procedures



Title: TN23
Author: Paul Cave – Technical Manager
Date: March 2015

Overview

As part of Excel Networking's ongoing commitment to quality this document will outline the control practices that have been employed concerning the production and supply of Fibre Optic Assemblies.

The first point to emphasise is the commitment to standards compliance and the environment by the Parent Company of Excel Networking, Mayflex Ltd, this is indicated by the ISO 14001, and RoHS statements attached.

The Fibre Optic Pre-terminated cells are located in both the UK and Asia and both operate under the same strict quality guidelines as laid out in this document.

From providing the initial quotation utilising our online configuration tool, which in turn creates, customer drawings, Bills of Materials and Manufacturing Orders, we are able to trace the complete process by way of a unique identifying code, right up until the point when the order is shipped to the client.

This allows full knowledge of cables, connectors at batch number level along with the staff involved in the production, testing and inspection of the products.

Procedures

Following the Manufacturing order being uploaded onto the system, the Components and Consumables are allocated from the dedicated stock held with the Assembly Cell, making note of batch numbers etc.

Visual inspection of these components is carried out at all stages, assembly, gluing, cleaving, curing etc, to ensure that each stage is completed to a satisfactory standard (no operator may inspect and sign off their own work).

Following the curing process the assemblies then go into an automated polishing process, during which the assemblies are regularly inspected. Furthermore the Polishing Films and pads are changed on a frequent basis to ensure optimum performance.

Once complete they then move on to the detailed inspection of the end face to check the overall quality of the polish, this looks at end-face contaminations as well as scratches and broken/chipped fibres. This process follows BS EN 61300-3-35 (Examinations and Measurements-Fibre optic connector end-face visual and automated inspection). This standard outlines the criteria for the number and details of the scratches and defects that can appear on the end-face, both in the core and cladding areas.

The following is a table taken from the document that outlines the limits for single mode with a return loss of ≥ 45 dB.

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Visible requirements for PC polished connectors, single mode fibre, RL \geq 45dB

Zone name	Scratches	Defects
A: core	None	None
B: cladding	No limit \leq 3 μ m None > 3 μ m	No limit < 2 μ m 5 from 2 μ m to 5 μ m None > 5 μ m
C: adhesive	No limit	No limit
D: contact	No limit	None \Rightarrow > 10 μ m

NOTE 1 For scratches, the requirement refers to width.

NOTE 2 No visible subsurface cracks are allowed in the core or cladding zones.

NOTE 3 All loose particles should be removed. If defect(s) are non-removable, it should be within the criteria above to be acceptable for use.

NOTE 4 There are no requirements for the area outside the contact zone since defects in this area have no influence on the performance. Cleaning loose debris beyond this region is recommended good practice.

NOTE 5 Structural features that are part of the functional design of the optical fibre, such as microstructures, are not considered defects.

Failure at this stage, initially results in re-polishing of the ends to see if this will rectify the problem, however this can only be attempted a limited number of times before the end is rejected due to potential 'over polishing'.

On completion of this stage they are passed onto the Return Loss/Insertion Loss Test Station for checking they exceed the requirements of the standards by a considerable margin. This varies regarding to the mode of fibre as well as the connector type, in the case of parallel optics a full list is available upon request. Note: we do have clients that due to the nature of their environment stipulate the Loss values they require on a specific SLA.

The assembly is then passed on to the final inspection and recording stage, when the concentricity of the end face is measured using an industry leading Daisi V2 Interferometer. This measurement ensures the end face of the connector has not been over or under polished and when mated with a connector of similar high quality, will provide optimum performance.

The end faces are visually inspected again for cleanliness - the final inspection checks if further cleaning is required prior to the product being packaged along with a label containing its unique reference and test results.

Equipment

Excel has invested heavily in a Daisi V2 and curing ovens and polishing machines to ensure that the manufacturing process is of the highest standard.

Inspection Microscope and Screen

The FVD-series digital fibre microscope is used to inspect the polished surface or cleaved ends of fibre optic connectors. This high-resolution bench-top inspection microscope is ideally suited for post-polish inspection of high-quality end faces and can repeatedly detect scratches that may be missed by human technicians. The FVD is connected to a PC display to provide optimum resolution.

We also have the option of using the FiberChekPRO in some stations as an advanced application that determines the acceptability of optical fibre end faces through automated inspection and analysis. It identifies and characterises



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defects and contamination and determines their location relative to the fibre core. It then provides a PASS or FAIL result according to a pre-configured failure criteria setting.

Return Loss/Insertion Loss Test Station

There are a range of machines in use, from a totally manual device for measuring both Single and Multimode Fibre Connectors at both wavelengths, through to fully automated test stations that can record the results through to a PC

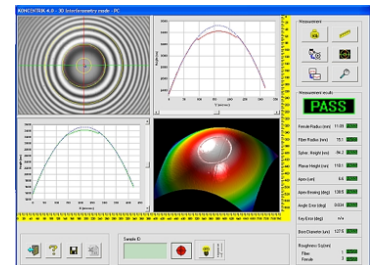


application.

DAISI v2 - Digital Automated Interferometer

The largest single item of expenditure in the facility is the DAISI v2 (Digital Automated Interferometer for Surface Inspection) which was designed with years of industry feedback in mind in order to satisfy the most demanding requirements for the use in the production environment.

Non-compressed, real time and high quality images are transferred from the hardware to the software via a USB2.0 high speed link in addition to the automation and control commands. DAISI is portable and can be interfaced to laptop or desktop computers. All calibration steps are automated and embedded into a user-friendly software interface in order to yield error-free and reliable measurements.



RoHS

As part of the parent company's ongoing commitment to the environment, they have introduced a series of initiatives to reduce not only waste and recycling but to eradicate all hazardous substances from our production.

Copies of the RoHS statements and ISO14001 have been included within this response.

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 **Certificate of Registration**

QUALITY MANAGEMENT SYSTEM - ISO 9001:2008

This is to certify that:

Mayflex UK Ltd
Excel House
Junction Six Industrial Park
Electric Avenue
Birmingham
B6 7JJ
United Kingdom

Holds Certificate No: FS 547274
and operates a Quality Management System which complies with the requirements of ISO 9001:2008 for the following scope:

Stockholding and supply of cabling infrastructure, networking products and internet protocol security products from quality assured sources without lot traceability. The assembly of data cabinets.

This registration was previously certified under BSI Certificate RS 28330, originally issued from 13/06/1994.

For and on behalf of BSI:



Gary Fenton, Global Assurance Director

Originally registered: **06/03/2009** Latest Issue: **27/01/2012** Expiry Date: **27/01/2015**

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Certificate of Registration

ENVIRONMENTAL MANAGEMENT SYSTEM - ISO 14001:2004

This is to certify that:

Mayflex UK Ltd
Excel House
Junction Six Industrial Park
Electric Avenue
Birmingham
B6 7JJ
United Kingdom

Holds Certificate No: **EMS 542863**

and operates an Environmental Management System which complies with the requirements of ISO 14001:2004 for the following scope:

Stockholding and supply of cabling infrastructure, networking products and internet protocol security products. The assembly of data cabinets.

For and on behalf of BSI:

Gary Fenton, Global Assurance Director

Originally registered: 19/11/2009

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EU Directive 2011/65/EU on the Restriction of the Use of Hazardous Substances in Electrical and Electronic Equipment

In July 2011 the Recast RoHS Directive was published by the European Commission in their Official Journal which, from the 2nd January 2013, makes it a legal document with which we need to comply with.

Mayflex are fully compliant with this directive and confirm that all of the products that we supply either directly or through our supply chain are fully compliant with this directive.

We have worked closely with all our suppliers in the period leading up to and following the law coming in to force to ensure a smooth transition.

Should you wish to discuss this matter further or have any questions that may not have been answered above please contact myself via email at martine@mayflex.com

Yours faithfully,

Martin Eccleston
Commercial Manager

Stock Acceptance QC Procedures

Further to the above procedures during production, Excel Networking also operates a batch inspection and testing program for any fibre pre-terminated assemblies that are produced in our facility in Asia. Due to the fact that we hold the inspection and testing equipment as outlined above within our UK facility we can randomly test batches of production for both quality and consistency. To date we are proud to state that we have not had one incident that requires quarantine, rejection or re-work of any of the assemblies that have been received into stock. This quality record has been achieved in over 12 years of production within the same factory.

Conclusions

Excel Networking is very proud of the reputation it has achieved for both accuracy and quality of fibre optic pre-terminated solutions and we welcome all feedback that assists in maintaining our high levels.

I trust this is sufficient for your needs, if you have any queries please do not hesitate to contact me.

Yours Sincerely

Paul Cave, RCDD, RTPM, CDCDP
Technical Manager – Infrastructure.

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