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# Optical Fibre Cabling Sub-system Field Testing Procedure (NCS / November 2008 – Revision 3.00) Summary Document

## 1. Introduction

In respect to warranty application, this document summarises the mandatory requirements for the testing of Nexans Cabling Solutions (NCS) optical fibres links

For further information, a more comprehensive NCS document is available at ...

This new procedure has been produced due to :-

- the current evolution of the both relevant standards (ISO 14763-3 & ISO 61280-4-1).
- the discrepancies between the above two ISO documents.
- the lack of information about the practical use of some of the new requirements.

NCS has issued this new version of its testing procedure taking into account both legacy and new Standards requirements.

For warranty certification purposes, NCS will accept testing

- Performed with **either LSPM (Light Source & Power Meter) or Optical Time Domain Reflectometer (OTDR) test equipment**

and undertaken according to

- The legacy procedure as **per ISO11801**
  - Using standard grade test cords
  - ISO11801 attenuation limits

NCS requires the use of the one-cord method, or the two-cord setup 2 method (ISO 61280-4-1 draft 2008) if the connector on the LSPM test equipment is not inter-changeable and different to that of the ones on the OF link to be tested.

**N.B. The use of the 3-cord method (LSPM testing) is not supported by NCS.**

## 2. The NCS Certified System Warranty

For both LSPM and OTDR testing the analysis of the test results (Comparison of the measured attenuation against the standard limits) has to be performed by the operator.

NCS requires the submission of full test reports including the “Pass” margin. 100 % of the installed OF links have to be tested and must pass the acceptance criteria in order to apply for NCS LANmark warranty certification.

If your chosen tester does not deliver an automatic report, the updated Complementary OF Warranty Application Form (developed by NCS) has to be completed in order to provide NCS with the full data.

This form can be downloaded from the NCS website: <http://www.nexans.com/lansystems>.

**N.B. In the Certified Solution Warranty section, all warranty documentation can be downloaded.**

### 3. LSPM Field Test Procedure

#### 3.1. Limits according to ISO 11801

**N.B. Standard grade test cords shall be used when testing according to ISO 11801**

<b>Link loss (dB) = Cable loss + Connectors loss + Splices loss</b>
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Optical Fibre type	Loss/km			Loss	
	850 nm	1310 nm	1550 nm	Connector	Splice
	(in dB)			ST-SC-LC-MTRJ	
Multimode 62,5 µm	3,50	1,50	NA	0,75	0,30
Multimode 50 µm	3,50	1,50	NA	0,75	0,30
Singlemode	NA	1,00	1,00	0,75	0,30

#### 3.2. Test tool configuration

Here are the Index of refraction values to be used with the NCS fibres.

Index of refraction			
Optical Fibre type	850 nm	1310 nm	1550 nm
Multimode 62,5 µm (OM1)	1,4989	1,4935	NA
Multimode 50 µm (OM2, OM3)	1,485	1,484	NA
Singlemode (OS1, OS2)	NA	1,471	1,4719

#### 3.3. Testing

For LSPM testing NCS advises the use of Mandrels in the cord connected at the side of the light source.

The objective of a mode filter is to remove unwanted transient higher order modes and therefore eliminate measurement inaccuracies.

The mode filter for multi-mode fibres shall consist of five, close-wound turns on a smooth round mandrel whose diameter is selected to ensure transient modes have been attenuated and steady-state conditions have been achieved.

The diameter of the mandrel may differ from fibre to fibre depending on fibre and coating type.

Fibre size µm	Mandrel diameter sizes		
	250µ	2 mm testcord	3 mm testcord
ISO/IEC 61300-3-4			
50	18	16	15
62,5	20	18	17

**NB:** If cabled fibres are employed, the mandrel diameter is reduced by the cable radius.

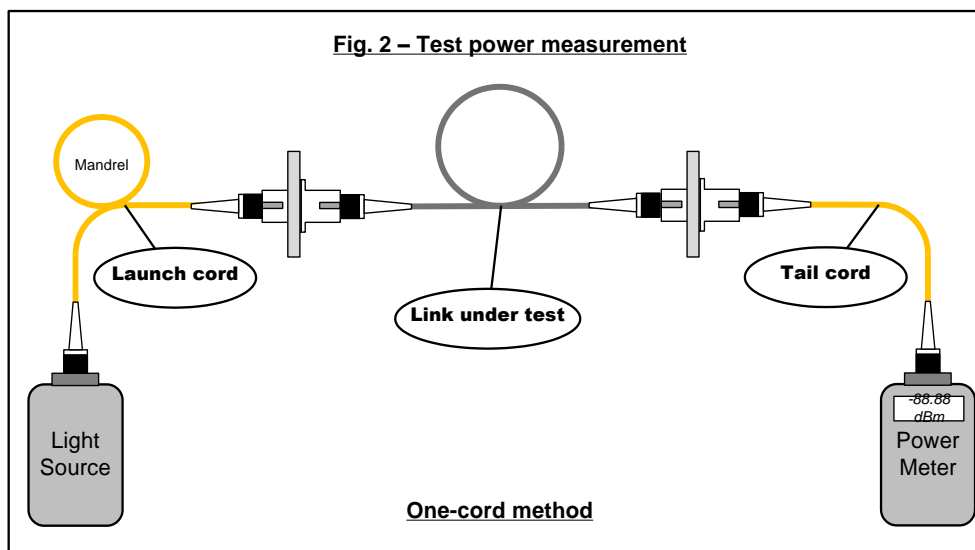
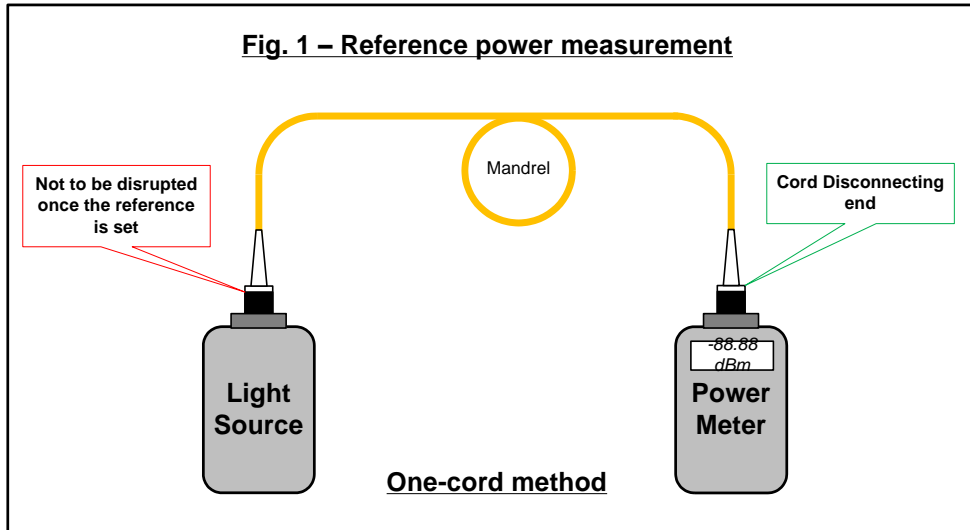
For single-mode measurements the mode filter shall include at least two metres of fibre with two loops of 50 mm diameter.

### 3.3.1. “One-Cord” Method - Single fibre measurement (RTM)

This procedure is fully compliant with the ISO 61280-4-1: Reference Test Method for links terminated on patch panels on both sides.

The one-cord method is the method recommended by NCS for use when the connector in the link is the same as the one on the tester.

**NB:** Some testers are equipped with interchangeable adaptor SC, LC or ST

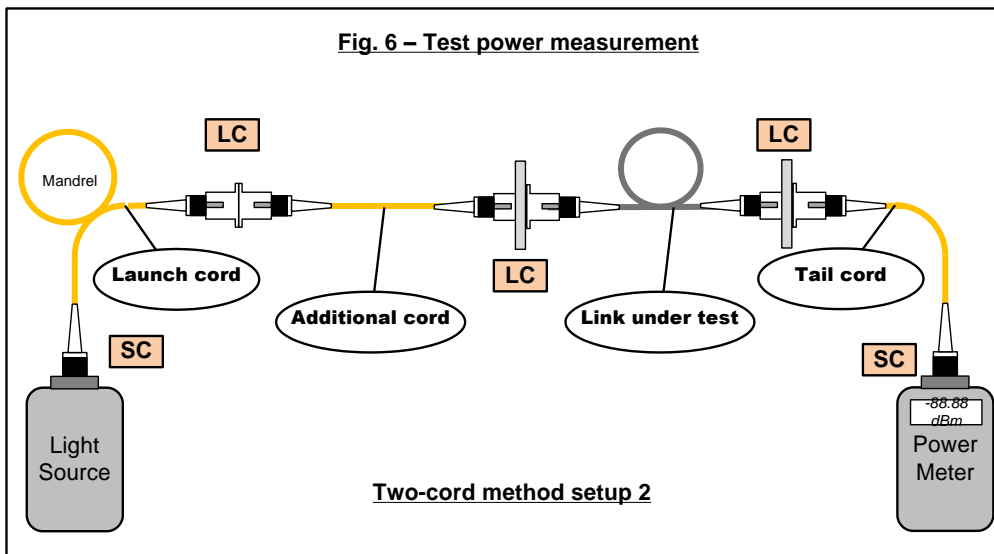
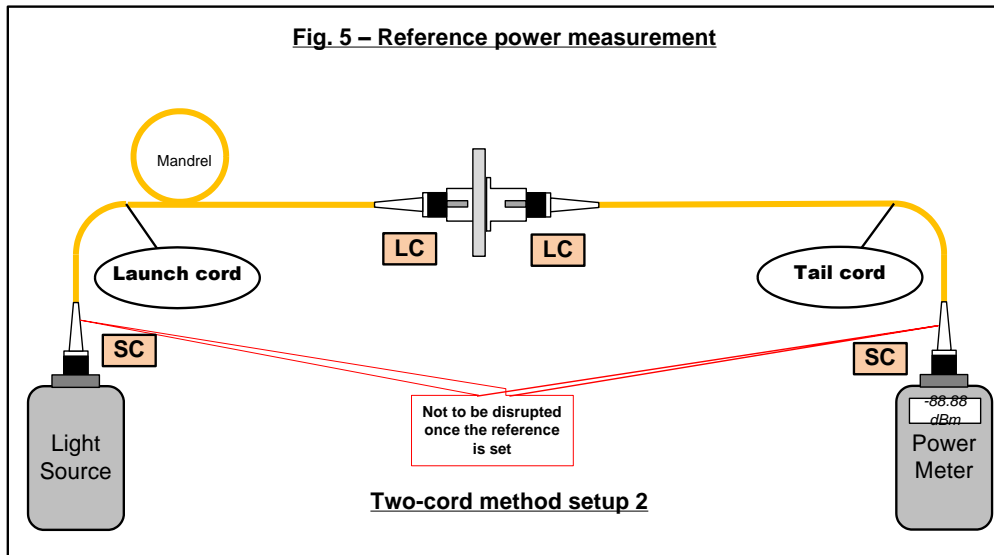


### 3.3.2. “Two-Cord” Method / Setup 2 - Single fibre measurement (ATM)

This procedure is fully compliant with the ISO 61280-4-1: Alternative Test Method for links terminated on patch panels on both sides when link and LSPM connectors are different.

This method is the one recommended by NCS to perform measurements when

- the connectors in the link are not the same as the ones on the tester
- the link is terminated with **LC** or **MT-RJ** connectors



## 4. OTDR Field Test Procedure

### LANmark Warranty submission:

The LANmark warranty certificate will provide a warranty for each individual link.

Together with the submission form, the original OTDR traces for each link (in both wavelengths) and the measured link loss must be provided when applying for 25 year LANmark-OF warranty certification. In case of bi-directional measurement all four traces have to be provided including the analysis of the traces and the average losses for both wavelengths.

N.B. Details relating to the settings for range, pulsewidth, index of refraction and averaging time must also be included.

If the OTDR does not provide test result analysis features, the original trace files must be sent to Nexans together with one completed NCS OF complementary Excel form per cable assembly. Make sure the same link references between the trace files and the complementary form are used.

The negative loss values must be entered into the complementary OF form by typing a '-' sign before all the values for both wavelengths.

The PC Trace software needed to view, analyse and manage the graphics has to be provided to NCS by the installer.

In each trace the fibre under test including the connections should be clearly visible. NCS will not accept traces where the event dead zones of connections are overlapping each other.

### 4.1. Loss testing methodologies

**The use of a Launch and Tail (receiving) cord is required** in order to obtain the full attenuation of the link including the fibre and both connectors of the link under test.

#### **Direction of measurement**

Uni-directional measurement (test in one direction only) should be conducted where the cabling under test comprises a single length of fixed fibre (NCS fibre) with two connectors and where the fibres of the launch and tail cords have the same scattering characteristics.

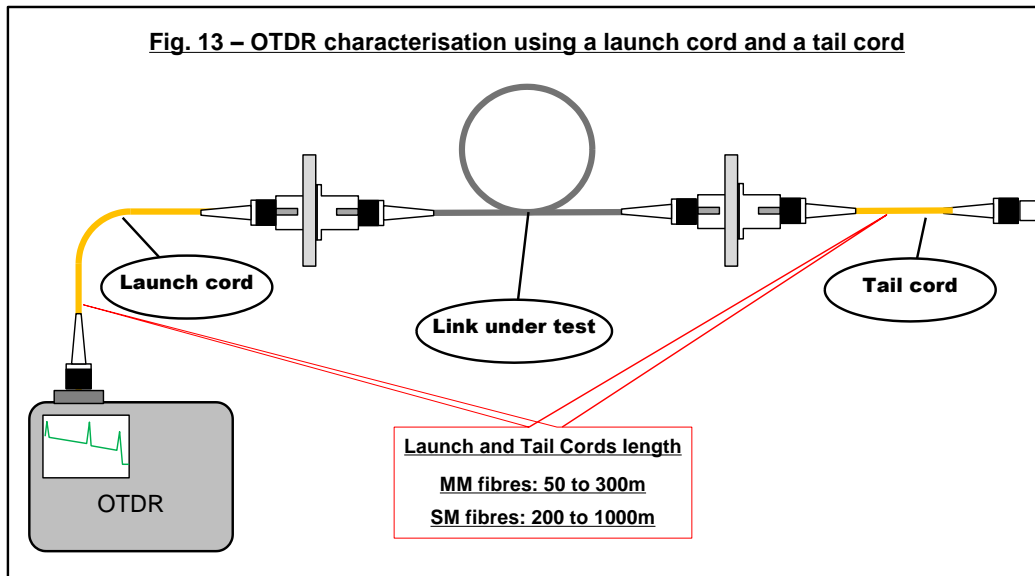
The link **insertion loss value** is obtained from the trace by setting both markers including all events from the link under test.

If the Launch and Tail cords differ in scattering characteristics a bidirectional measurement should be applied. The insertion loss value is achieved by calculating the mean of the two results.

<b>Link loss (dB) = Cable loss + Connectors loss + Splices loss</b>
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## 4.2. Testing



## 4.3. Test tool configuration

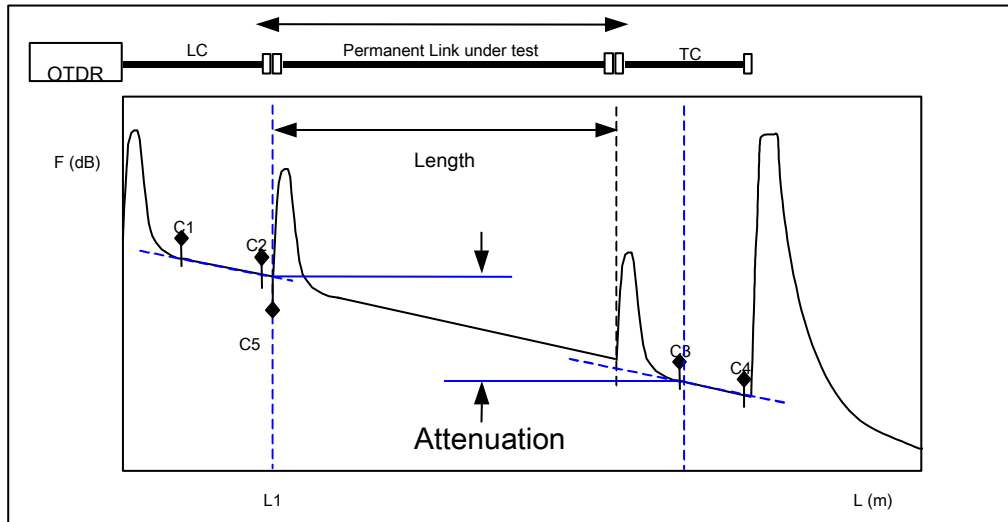
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Following minimum and maximum Launch and Tail cord lengths must be applied.

	MM Fibre link length < 300m	MM Fibre link length > 300m	SM Fibre link length < 500m	SM Fibre link length > 500m
Launch and Tail cord length	50 – 100 m	50 – 300 m	200 - 500 m	500 – 1000 m
Maximum Pulsewidth	5 ns	10 ns	10 ns	20 ns
Range	1000 m	2000 – 3000 m	2000 m	3000 – 5000 m

The following OTDR trace represents the most common test case found in the field.



The attenuation comprises the loss from the fibre length under test and the total loss for both connections.

In case of disputable traces, an additional loss test by means of LSPM may be requested by NCS.