



## **SPECIFICATION FOR OPTICAL FIBRE SPLICING EQUIPMENT**

- 1. Fusion Splicer**
- 2. Precision Cleaver**
- 3. Preparation Tool Kit**
- 4. Splicing Training**

**SPC-00568  
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**Revision 3.00**

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**I DOCUMENT AUTHORISATION**

FUNCTION	NAME	TITLE & DIVISION	SIGNATURE	DATE
<b>Compiled by :</b>	BG Nel	Technologist Quality Assurance	<i>Signed</i> BG Nel	07/03/2008
<b>Reviewed by :</b>	F Nel	Programme Manger, Project Services	<i>Signed</i> F Nel	07/03/2008
<b>Authorised by :</b>	M Nuttall	Divisional Manager, Transmission Services	<i>Signed</i> M Nuttall	11/03/2008

**II DISTRIBUTION**

Once updated, a copy of the latest revision will be published in the document management system in use. E-mail to this effect will be sent to the relevant personnel or heads of department.

**III DOCUMENT CHANGE HISTORY**

ISSUE NO.	DATE ISSUED	ISSUED BY	HISTORY DESCRIPTION
1.00	June 2001	Transmission	Old format
2.00	October 2006	Project Services	Converted to ISO standard and made minor technical changes
3.00	January 2011	Transmission	Minor technical changes.

**IV CHANGES SINCE LAST REVISION**

CLAUSE	DESCRIPTION
All clauses	Converted to ISO standard
2.12	Change values
3.6	Change subclause
14.1	Change specification reference number

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**V ABBREVIATIONS, ACRONYMS AND DEFINITIONS**

<b>ABBREVIATIONS AND ACRONYMS</b>	<b>DESCRIPTION</b>
<b>AC</b>	Alternating Current
<b>CD</b>	Compact Disc
<b>dB</b>	Decibel
<b>DC</b>	Direct Current
<b>LCD</b>	Liquid Crystal Display
<b>MM</b>	Multi-mode
<b>PC</b>	Personal Computer
<b>PCMCIA</b>	PC Interface Slot
<b>RCA</b>	Trade Name Connector
<b>RH</b>	Relative Humidity
<b>SM</b>	Single-mode
<b>TFR</b>	Thin Film Transistor LCD

<b>DEFINITIONS</b>	<b>DESCRIPTION</b>
<b>None</b>	

**VI RELEVANT DOCUMENTATION**

**APPLICABLE**

<b>DOCUMENT NO.</b>	<b>DESCRIPTION</b>	<b>LOCATION</b>

**RELEVANT**

<b>DOCUMENT NO.</b>	<b>DESCRIPTION</b>	<b>LOCATION</b>

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## 1. GENERAL

- 1.1 This specification describes the requirements for a Fully Automatic Fusion Splicer to be used for splicing single-mode and multi-mode fibre systems in use by Transnet Freight Rail.
- 1.2 The Fusion Splicer must be portable and rugged and designed for field usage.
- 1.3 Fibre type splicing capabilities shall include automatic detection and splicing of Single mode G.652, Multi Mode G.651, DSF G.653, NZDSF G.655 and Bend Insensitive G.657 type fibres.
- 1.4 Preference will be given to units capable of splicing within a total splice cycle time of less than 20 seconds.
- 1.5 Single-mode fibres shall be aligned and spliced via core alignment principle (local light injection) and the alignment performance shall be independent of fibre coating colour and/or buffering.
- 1.6 Multi-mode fibre alignment shall be via a profile/cladding principle and the alignment performance shall be independent of fibre coating colour and/or buffering.
- 1.7 All points of divergence from this specification must be clearly stated.

## 2. SPLICING PROCEDURE

- 2.1 Automatic alignment of fibres in x, y and z axes with manual override.
- 2.2 Viewing of the fibres alternately in both the x and y axes.
- 2.3 Automatic pre-fusion to clear fibre end faces of foreign objects.
- 2.4 Automatic cleave quality inspection to user defined limits with abort/warning for unacceptable cleave angles.
- 2.5 Automatic compensation of fusion parameters for atmospheric, fibre, temperature and electrode conditions.
- 2.6 Pre arc test, to test arc conditions and display results.
- 2.7 Core alignment method must be used for splicing single-mode and dispersion shifted fibres with a splice time of  $\pm 9$  seconds
- 2.8 Splicer must be able to splice non-similar fibres like dispersion shifted to SMF-28.

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- 2.9 Adjustment to splice non-similar fibres must be done automatically through measurements made during the pre-fusion stage mentioned in subclause 2.3.
- 2.10 Automatic minimum tensile test of  $\geq 1.5\text{N}$  must be done on fibre after splice has been completed.
- 2.11 Automatic splice loss estimation after fusion.
- 2.12 Constant low loss splices must be achieved - an average estimation loss of 0,01 dB or better for identical single-mode fibres, 0,02 dB or even better for multi-mode fibres and 0,05 dB for dispersion shifted fibres must be achieved.

### 3. MEMORY AND SOFTWARE REQUIREMENTS

- 3.1 The Fusion Splicer shall be capable of storing a minimum of 10 pre-defined factory-splicing programs in internal non-volatile memory for recall.
- 3.2 The Fusion Splicer shall be capable of storing a minimum of 20 user-defined splicing programs in internal non-volatile memory for recall. The splicer settings must be automatically (self-learning) as per subclause 2.5.
- 3.3 The Fusion Splicer shall be capable of storing data of 7000 splice results in built in memory. Tenderer to state actual splice data storage capability.
- 3.4 The Fusion Splicer shall be capable of automatically calculate and set fusion parameters for various fibre types as well as altitude correction. This data must be stored as a user-defined splicing program.
- 3.5 The Fusion Splicer must be supplied with PC communication software package to facilitate the editing of splicing parameters, loading/downloading of splice programs and to enable print out and storage of splice results and splicer settings.
- 3.6 The software must operate with Windows 2000 and Windows XP type operating systems.
- 3.7 The option for a further 14 000 to 30 000 splices data, or 100 splice images, must be stored on a PCMCIA memory card.

### 4. DISPLAY REQUIREMENTS

- 4.1 The Fusion Splicer shall be equipped with a HI visibility TFT colour and a minimum display size of 120 mm measured diagonally. Tenderer to state actual size.

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- 4.2 The display shall facilitate viewing of the fibres as follows :
- 4.2.1 X and Y axes of both fibre ends prior to fusion.
  - 4.2.2 Fibre end face angle prior to fusion.
  - 4.2.3 The fibres during arc cleaning and fusion process.
  - 4.2.4 Fibre splice in both the x and y axes after fusion preferable without moving parts.
  - 4.2.5 Estimated splice loss value in dB.
  - 4.2.6 Splice abnormalities or acceptability.
  - 4.2.7 The "hot images" of the splice taken during fusion in both x and y axes.
  - 4.2.8 Estimated splice loss value.
  - 4.2.9 Splicing abnormalities.
- 4.3 The display shall furthermore facilitate viewing of splicing programs, splicing parameters and other set-ups for editing purposes. User dropdown menus to be incorporated in user interface.
- 5. POWER SUPPLY REQUIREMENTS**
- 5.1 AC Operation : 90 to 260 volts, 50 to 60 Hz
  - 5.2 DC Operation : 10,5 to 14 volts
  - 5.3 A 3 metre DC power cord terminated in crocodile clamps must be included with the unit.
- 6. REMOTE INTERACTIVE MAINTENANCE SYSTEM**
- 6.1 It must be possible to remotely upload and download new software versions.
  - 6.2 It must be possible to transmit video camera images via the build-in modem card.
  - 6.3 It must be possible to remotely adjust the operating parameters or locate and identify problems in the field.
  - 6.4 Remote communication to the splicer via a dial-up connection must be possible.

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## 7. ENVIRONMENTAL CONDITIONS

- 7.1 Operating Temperature : -10 °C to 50 °C
- 7.2 Operating Humidity : Maximum 95% RH (non-condensing)
- 7.3 Altitude : 0 – 3600 m
- 7.4 Storage Temperature : -40 °C to 70 °C

## 8. EXTERNAL CONNECTIONS

- 8.1 Minimum of 1 USB port for the down loading of splice data to a PC, printing of splice data, updating of splice software and performing diagnostics.
- 8.2 RCA video output.
- 8.3 AC input 220 volt AC 50 Hz .
- 8.4 DC input 12 volt DC.
- 8.5 DC output 12 volt DC for powering other accessories.

## 9. PROTECTIVE CASING

- 9.1 The Fusion Splicer must be portable and supplied in a suitable protective (hard) case with suitable accommodation for all accessories. To ensure equipment safety during transportation.
- 9.2 Tenderers must state the type of material the protective case is manufactured from.

## 10. OVEN FOR SHRINKING OF SPLICE PROTECTORS

- 10.1 The Fusion Splicer must include dual heat ovens for shrinking of splice protectors. The heat oven temperature and timing must be adjustable to accommodate and compensate for varying splice protectors and environmental conditions respectively..

## 11. PRECISION CLEAVER

- 11.1 The Fusion Splicer must be accompanied by a precision cleaver capable of :
- 11.1.1 Fibre type : 250 µm and 900 µm jacketed single fibre.

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- 11.1.2 Clad diameter : 80  $\mu\text{m}$  to 150  $\mu\text{m}$  .
- 11.1.3 Cleave length : 12 mm to 20 mm .
- 11.1.4 Typical cleave angle : 0,5°.
- 11.1.5 Blade life : > 36 000 fibre cleavings.
- 11.1.6 Blade type : Circular blade with 12 cutting positions.

## 12. PREPARATION TOOL KIT

12.1 The Fusion Splicer must be supplied with a fibre preparation tool kit which includes the following minimum requirements :

- 12.1.1 250  $\mu\text{m}$  Primary Coat stripper.
- 12.1.2 900  $\mu\text{m}$  tight buffer stripper.
- 12.1.3 High leverage Kevlar Shears.
- 12.1.4 1,6 mm to 3 mm Jacket remover.
- 12.1.5 99,5% Isopropyl alcohol (200 ml).
- 12.1.6 Cable stripper.
- 12.1.7 Canned, non-residue filtered compressed air, 400 ml .
- 12.1.8 Fibre scrap bin.

## 13. TRAINING

13.1 Tenderers must quote separately for training in optical fibre splicing. Training must be conducted at the regional installation depots.

- 13.1.1 Cost per session.
- 13.1.2 Number of sessions.
- 13.1.3 Number of candidates that can be accommodated per session.

13.2 Training must comply with Transnet Freight Rail specification SPC-00003.

## 14. DOCUMENTATION

14.1 All documentation must be available on CD.

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