3M

Fibrlok™ II Universal Optical Fiber Splice 2529 (Singlemode)

Technical Report

May 2006
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Introduction

The 3M™ Fibrlok™ II Universal Optical Fiber Splice 2529 is a high-performance, easy-to-use mechanical optical fiber splice. The Fibrlok II universal splice can be used with either singlemode or multimode fibers with a cladding diameter of 125 microns. It will accommodate any combination of fibers with coating diameters from 250 µm to 900 µm. In addition, the universal optical fiber splice incorporates a single cleave length for splicing both 250 and 900-micron coated fibers and provides the ability to “reposition” fibers for increased splicing yields.

The splice consists of four molded polymeric components and an aluminum alloy alignment element. The four polymeric components are jacket, end plug (2), and cap. The jacket is provided with a compartment to house the aluminum alloy element. The end plugs are attached to each end of the jacket and locate the element laterally within the splice jacket. Each splice end plug contains a fiber entry port, which is used to guide either 250 or 900-micron coated optical fiber into the alignment element. During Test splice actuation, the cap acts on the element to align and secure the fibers within the splice. All splice components are factory-assembled. An index matching gel is pre-installed in the splice element.

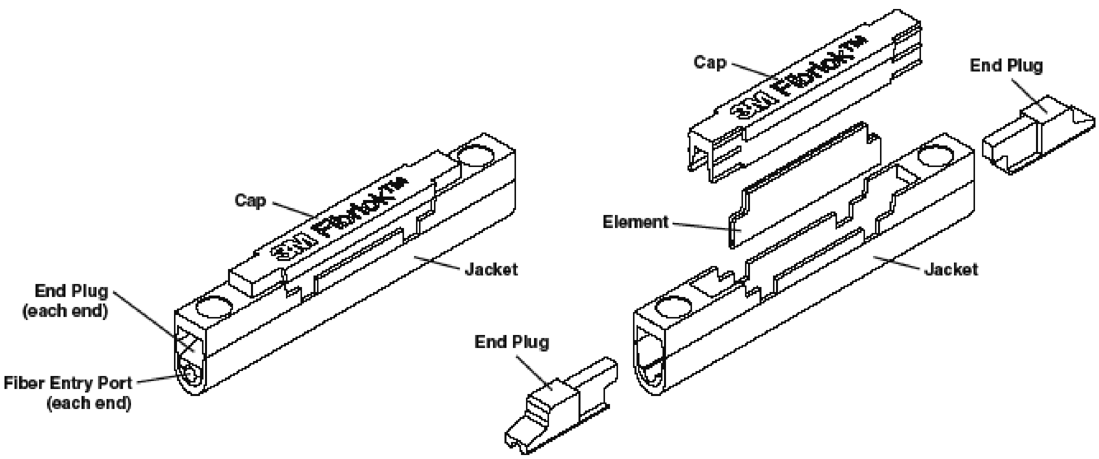

Fig. 1—3M™ Fibrlok™ II Universal Optical Fiber Optic Splice

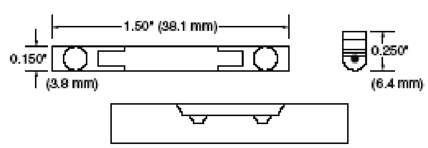

Fig. 2—3M™ Fibrlok™ II Universal Optical Fiber Optic Splice Dimensions

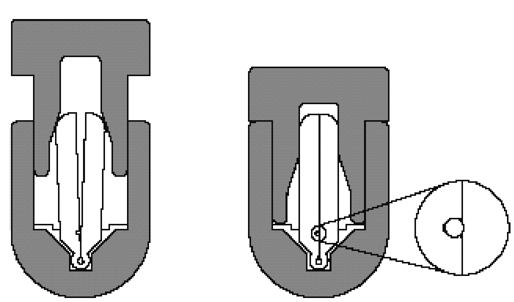

Fig. 3—3M™ Fibrlok™ II Universal Optical Fiber Optic Splice Cross-Section

The 3M™ Fibrlok™ II Splice is held within the 3M™ Fibrlok™ Assembly Tool 2501 when the splice is made in the field. After the fibers are inserted into the splice, the cap is depressed with the assembly tool. The motion of the cap squeezes the "legs" of the element so the "legs" come together. The fibers are permanently aligned and gripped in the splice when the cap is actuated.

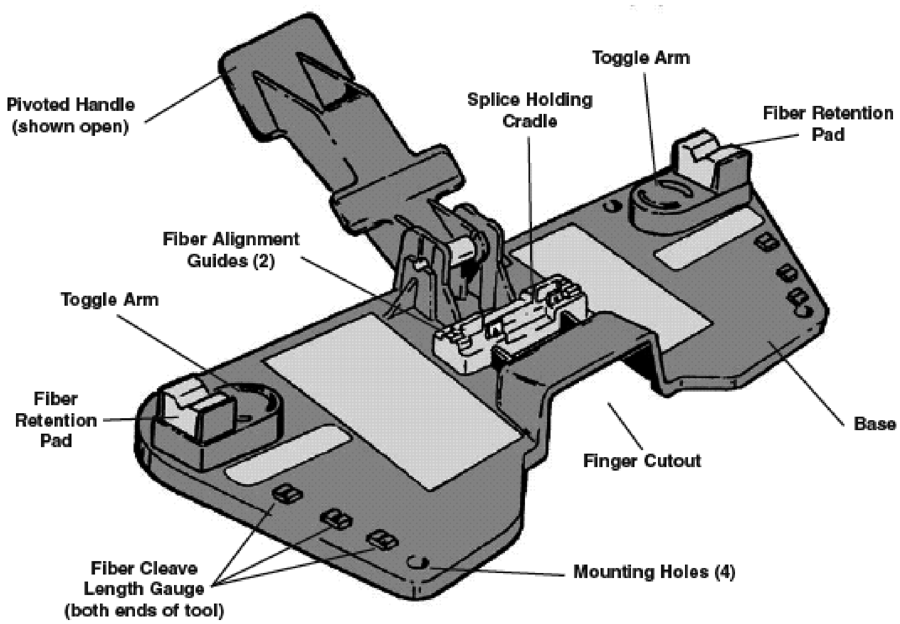

Fig. 4—3M™ Fibrlok™ Assembly Tool 2501

Environmental Life Test Series

The Environmental Life Test Series is designed to analyze the life test performance of the splice including vibration, temperature cycling, and environmental degradation (final tensile testing). 3M performed the environmental tests described below referencing the test methods stated in Telcordia GR-765-Core Generic Requirements for Singlemode Optical Splices and Splicing Systems, Issue 1, Sept. 1995.

Prior to testing, the splices were placed in a vertical orientation and conditioned for 15 days at 60°C (140°F). Splices undergoing the Environmental Life Test Series were then spliced and subjected to the following sequential life tests as indicated below:

Initial Splice Loss

Thirty Fibrlok II splices were constructed. Fibers were cleaved flat and built on singlemode fiber

Initial Loss (dB)

Wavelength	Initial Insertion Loss	Initial Insertion Loss Std. Dev.	Initial Return Loss	Initial Return Loss Std. Dev.
1310nm	-0.07	0.03	-58.61	2.08
1550nm	-0.05	0.02	-59.24	1.82

Splice Strength

The thirty 3M™ Fibrlok™ II Universal Splices were tested with a 4.4 N (1.0 lb-f) tensile load applied to the splice for five seconds, and the change in splice insertion loss was measured.

Initial Loss (dB)

Wavelength	Initial Insertion Loss	Initial Insertion Loss Std. Dev.	Initial Return Loss	Initial Return Loss Std. Dev.
1310nm	-0.07	0.03	-58.58	2.08
1550nm	-0.05	0.02	-59.29	1.71

Temperature Cycling (50 cycles)

The thirty Fibrlok II universal splices were subjected to temperature cycles (uncontrolled humidity) from -40°C to +75°C. Loss and reflectance were measured at 15-minute intervals during test temperature cycling.

Insertion Loss (dB)

Wavelength	Initial Mean	Initial Std. Dev.	Mean During Test	Std. Dev. During Test	Mean Final	Std. Dev. Final
1310nm	-0.07	0.03	-0.08	0.02	-0.08	0.04
1550nm	-0.05	0.02	-0.05	0.01	-0.05	0.03

Return Loss (dB)

Wavelength	Initial Mean	Initial Std. Dev.	Mean During Test	Std. Dev. During Test	Mean Final	Std. Dev. Final
1310nm	-58.58	2.08	-46.20	7.39	-58.36	2.23
1550nm	-59.29	1.71	-45.80	7.55	-58.62	1.66

Humidity/Condensation Cycling

The thirty Fibrlok II universal splices were subjected to fifteen (15) humidity/condensation cycles that ranged in temperature from -10°C to +65°C. Humidity was controlled to 90-98% at various stages of the cycle and humidity left uncontrolled at others. Loss and reflectance were measured at 15 minute intervals during test humidity/condensation cycling.

Insertion Loss (dB)

Wavelength	Initial Mean	Initial Std. Dev.	Mean During Test	Std. Dev. During Test	Mean Final	Std. Dev. Final
1310nm	-0.08	0.04	-0.08	0.01	-0.07	0.03
1550nm	-0.05	0.03	-0.06	0.01	-0.05	0.03

Return Loss (dB)

Wavelength	Initial Mean	Initial Std. Dev.	Mean During Test	Std. Dev. During Test	Mean Final	Std. Dev. Final
1310nm	-58.20	2.10	-50.25	5.98	-55.20	2.68
1550nm	-59.34	1.24	-50.29	6.74	-58.15	1.83

Vibration Splice Loss

The thirty 3M™ Fibrlok™ II Universal Splices were mounted in a 3M™ Fibrlok™ Splice Organizer Tray 2524, attached to a vibration test unit, and subjected to simple harmonic motion having an amplitude of 0.76 mm (0.03 inch) and 1.52 mm (0.06 inch) maximum total excursion. The vibration frequency was varied between 10 and 55 Hz. The entire frequency range, from 10 to 55 to 10 Hz, is traversed in approximately one minute. The splices were tested for two hours in each of three mutually perpendicular planes per EIA Standard FOTP 11, Condition I (IEC 61300-2-1). Change in insertion loss during test vibration was measured.

Insertion Loss (dB)

Wavelength	Initial Mean	Initial Std. Dev.	Mean During Test	Std. Dev. During Test	Mean Final	Std. Dev. Final
1310nm	-0.07	0.03	-0.07	0.01	-0.07	0.03
1550nm	-0.05	0.03	-0.06	0.01	-0.06	0.03

Return Loss (dB)

Wavelength	Initial Mean	Initial Std. Dev.	Mean During Test	Std. Dev. During Test	Mean Final	Std. Dev. Final
1310nm	-55.16	3.11	-50.29	0.23	-55.26	2.90
1550nm	-58.03	1.97	-58.64	0.51	-59.07	1.77

Temperature Cycling (50 cycles)

Splices were temperature cycled for 50 additional cycles from -40°C to +75°C. Loss and reflectance were measured during test temperature cycling.

Insertion Loss (dB)

Wavelength	Initial Mean	Initial Std. Dev.	Mean During Test	Std. Dev. During Test	Mean Final	Std. Dev. Final
1310nm	-0.07	0.03	-0.07	0.02	-0.07	0.03
1550nm	-0.06	0.03	-0.07	0.01	-0.07	0.03

Return Loss (dB)

Wavelength	Initial Mean	Initial Std. Dev.	Mean During Test	Std. Dev. During Test	Mean Final	Std. Dev. Final
1310nm	-54.10	2.74	-45.95	6.99	-57.23	2.75
1550nm	-58.89	2.14	-46.18	7.57	-59.44	1.78

Environmental Degradation

A 4.4 N (1.0 lb-f) tensile load was applied to the splice for five seconds and change in loss was measured.

Initial Loss (dB)

Wavelength	Initial Insertion Loss	Initial Insertion Loss Std. Dev.	Initial Return Loss	Initial Return Loss Std. Dev.
1310nm	-0.08	0.03	-57.22	2.75
1550nm	-0.08	0.03	59.46	1.72

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