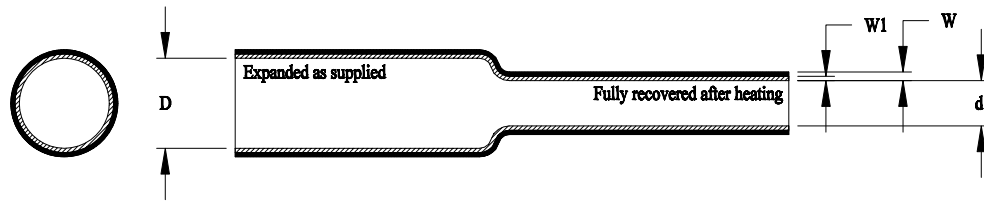


## FL2500 Heat - Shrinkable Tubing



**Table 1: Dimensions**

| Size  | Expanded I.D. Minimum (D) | Recovered I.D. Maximum (d) | Recovered Total Wall (W) $\pm 0.012 (.31)$ | Recovered Adhesive Wall Minimum (W1) | Marking (in White Ink) |
|-------|---------------------------|----------------------------|--------------------------------------------|--------------------------------------|------------------------|
| No. 0 | 0.200 (5.1)               | 0.050 (1.3)                | 0.055 (1.39)                               | 0.027 (0.68)                         | FL-0                   |
| No. 1 | 0.300 (7.6)               | 0.065 (1.7)                | 0.060 (1.52)                               | 0.028 (0.71)                         | FL-1                   |
| No. 2 | 0.355 (9.0)               | 0.090 (2.3)                | 0.060 (1.52)                               | 0.028 (0.71)                         | FL-2                   |
| No. 3 | 0.455 (11.6)              | 0.100 (2.5)                | 0.090 (2.29)                               | 0.052 (1.32)                         | FL-3                   |
| No. 4 | 0.700 (17.8)              | 0.175 (4.4)                | 0.100 (2.54)                               | 0.053 (1.35)                         | FL-4                   |

**Color:** Jacket shall be black; adhesive liner shall be white.

**Table 2: Properties**

| Property                                    | Unit        | Requirement       | Test Method                              |
|---------------------------------------------|-------------|-------------------|------------------------------------------|
| Dimensions                                  | Inches      | Table 1           | ASTM D 2671                              |
| Tensile Strength                            | PSI         | 1500 minimum      | ASTM D 2671<br>Speed 2 in. / min. Note 1 |
| Ultimate Elongation                         | Percent     | 300 minimum       | ASTM D 2671<br>Speed 2 in. / min.        |
| Secant Modulus (Expanded Form)              | PSI         | 35000 minimum     | ASTM D 2671<br>Note 1                    |
| Longitudinal Change                         | Percent     | +0, -10           | ASTM D 2671                              |
| Concentricity (Expanded Form)               | Percent     | 60 minimum        | ASTM D 2671                              |
| Dielectric Strength (Jacket Only)*          | Volts / mil | 500 minimum       | ASTM D 149                               |
| Volume Resistivity                          | ohm-cm      | $10^{13}$ minimum | ASTM D 257                               |
| Immersion Leak Resistance                   | micro-amps  | 0.25 maximum      | Note 2                                   |
| Thermal Cycling<br>5 cycles<br>5°C to 130°C | micro-amps  | 0.25 maximum      | Note 3                                   |

\*Remove adhesive manually prior to testing.

### SPECIFICATION CONTROL DRAWING

|                                                                                                                                                       |  |                                                                                    |            |                                                                                     |  |                                                            |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------|--|------------------------------------------------------------|------------------|
|                                                                    |  | Tyco Electronics Corporation<br>300 Constitution Drive<br>Menlo Park, CA 94025 USA |            |  |  | Title:<br><b>FL2500</b><br><b>Heat - Shrinkable Tubing</b> |                  |
| Tyco Electronics reserves the right to amend this drawing at any time.<br>Users should evaluate the suitability of the product for their application. |  |                                                                                    |            | Document No :<br><b>FL2500</b>                                                      |  |                                                            |                  |
| Unless otherwise specified dimensions are in inches.<br>[Metric dimensions are shown in brackets]                                                     |  |                                                                                    |            |                                                                                     |  |                                                            |                  |
| Cage Code:<br>06090                                                                                                                                   |  | Scale:<br>None                                                                     | Size:<br>A | Rev. Date:<br>July 14, 2006                                                         |  | Rev.:<br>G                                                 | Sheet:<br>1 of 3 |

## SPECIFICATION CONTROL DRAWING

### Properties: (continued)

| Property                                                                                   | Unit       | Requirement                                 | Test Method       |
|--------------------------------------------------------------------------------------------|------------|---------------------------------------------|-------------------|
| Heat Shock<br>4 hrs. at 250°C                                                              | --         | No dripping, flowing, or cracking of jacket | ASTM D 2671       |
| Thermal Aging<br>168 hrs. at 130°C<br>followed by Immersion<br>Leak Resistance, Note 2     | micro-amps | 0.25 maximum                                | Note 4            |
| Flame Test                                                                                 | --         | Self-extinguishing within 30 seconds        | SAE J1128, Note 5 |
| Fluid Resistance<br>24 hrs. at 25°C ± 3°C<br>ASTM Reference Fuel C<br>VV-F-800 Diesel Fuel | micro-amps | 0.25 maximum                                | Note 6            |
| 1hr. at 100°C ± 3°C<br>ASTM #3 Oil                                                         |            |                                             |                   |

**Qualification Sizes:** FL2500-2 qualifies FL2500-0, -1, -2, -3 and -4.

**Note 1:** Tensile Strength & Secant Modulus

Calculate Tensile Strength and Secant Modulus based on wall thickness of jacket only.

**Note 2:** Immersion Leak Resistance

Prepare 3 test assemblies insulated with FL2500-2 as follows: Construct a 3-wire to 3-wire inline splice in any suitable manner (crimped, soldered, twisted or welded). Splice an AWG 14 and two AWG 12 wires to an AWG 14 and two AWG 12 wires. Each wire shall be approximately 12 inches long. The wire insulation shall be crosslinked polyolefin (TXL) and the conductor shall be bare copper. Shrink a 2.5-inch length of FL2500-2 over the splice area using a forced air oven set at 150 ± 3°C (302 ± 5°F) for 5 minutes. Allow the test assemblies to cool to room temperature and immerse them, except for the ends, in a 5% salt solution for 24 hours at room temperature. Apply 50 volts d-c to the immersed specimens and measure the leakage current.

**Note 3:** Thermal Cycling

Prepare 3 splice assemblies in accordance with Note 2 and subject them to 5 thermal cycles. One cycle consists of 30 minutes in a 5% saline solution at 5 ± 5°C and 30 minutes at 130 ± 5°C with a maximum of 2 minutes between temperatures. Specimens shall then be allowed to cool to room temperature for one hour minimum and shall be measured for leakage current in accordance with Note 2.

**Note 4:** Thermal Aging

Prepare 3 splice assemblies in accordance with Note 2 and hold for 168 hours at 130 ± 5°C. The specimens shall then be allowed to cool to room temperature for one hour minimum and shall be measured for leakage current in accordance with Note 2.

|                             |            |                               |                  |
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| Rev. Date:<br>July 14, 2006 | Rev.:<br>G | Document No.<br><b>FL2500</b> | Sheet:<br>2 of 3 |
|-----------------------------|------------|-------------------------------|------------------|

## SPECIFICATION CONTROL DRAWING

**Note 5:** Flammability

Prepare 6 splice assemblies in accordance with Note 2. Suspend a 24 in. (600 mm) sample of the finished spliced cable taut in a horizontal position within a partial enclosure which allows a flow of air sufficient for complete combustion, but is free from drafts. Use a flame spreader apparatus as described in SAE J1128. Position the top of the 2 in. (50 mm) vertical flame so that the top of the flame just touches the suspended specimen, with the flame spreader parallel to the axis of the spliced cable. Test 3 separate specimens with the flame in each of two positions: 1) Center the flame spreader under the edge of the heat-shrinkable tubing such that the flame is applied to approximately 1 in. (25 mm) of tubing and 1 in. (25 mm) of wire on the side with the single wire and 2) Center the flame spreader under the center of the approximately 2 inch long splice. Apply the flame for 15 seconds, as described in SAE J1128,. After removal of the Bunsen burner flame, the splice and adhesive shall not continue to burn for more than 30 seconds.

**Note 6:** Fluid Resistance

Prepare 9 splice assemblies in accordance with Note 2 and immerse 3 assemblies in each of the fluids specified for the time and temperature given. Measure leakage current in accordance with Note 2.

Acceptance tests shall consist of:

- Dimensions
- Tensile Strength
- Ultimate Elongation
- Heat Shock

Acceptance tests shall be performed on each lot of tubing or on a skip-lot basis per a statistically justified control plan determined by the TRM Division of Tyco Electronics.

Qualification tests shall consist of all the tests in this Specification Control Drawing.

|                             |            |                               |                  |
|-----------------------------|------------|-------------------------------|------------------|
| Rev. Date:<br>July 14, 2006 | Rev.:<br>G | Document No.<br><b>FL2500</b> | Sheet:<br>3 of 3 |
|-----------------------------|------------|-------------------------------|------------------|

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