

# Environment Testing

## Measurement Method



**CORNING**  
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Optical  
Fiber

### **MM27**

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### **Scope**

This information describes the reference method for measuring the induced attenuation in Corning® single-mode and multimode optical fibers in the following environmental tests:

- Temperature Dependence
- Temperature-Humidity Cycling
- Water Immersion, +23°C
- Heat Aging, +85°C

### **General**

These tests are intended to evaluate the performance of optical fibers when exposed to various environmental conditions. The effects of these tests on the optical performance of fibers are measured by the change in attenuation of the fibers from a known reference condition. The change in attenuation for single-mode fibers is measured under the conditions stated in the Corning single-mode spectral attenuation measurement method 25. The change in attenuation for multimode fibers is measured under the conditions stated in the Corning multimode attenuation measurement method 21.

### **Measurement Description**

For each of the following environmental tests, the fiber is loosely coiled (without a spool) with an inside diameter of >21 cm to provide a repeatable measurement condition. The coiled fiber for all of the tests below (except as noted) is thoroughly coated with a dry lubricant such as talcum powder and then placed in a storage container (or tray) to facilitate handling and reduce any possible measurement errors due to handling.

At the start of each test, a reference attenuation is determined. The change in attenuation is calculated at each measurement interval by measuring the attenuation at that interval and subtracting the reference attenuation from that number. All of the single-mode attenuation measurements are made in sites at the required intervals. Only multimode fibers are removed from the chamber before measurements are made. Common measured wavelengths are at 850 nm and 1300 nm for multimode fiber and 1310 nm and 1550 nm for single-mode fiber. A full spectral scan may also be measured and recorded.

**Environmental Test Conditions**

**Temperature Dependence**

The loose coiled test sample is placed in the test chamber with sufficient length of fiber outside to reach the measurement equipment. After the test sample has equilibrated, the reference measurement is made at the initial temperature of +23°C. The fiber coil is temperature cycled as follows:

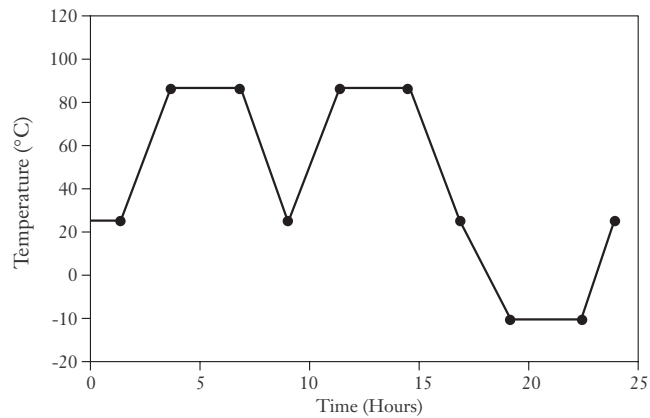
- Test Cycle: +23°C to -60°C to +23°C to +85°C to +23°C
- Hold Time at Each Temperature: ≥1 hour
- Number of Consecutive Cycles: 2, with a final measurement at +23°C
- Measurements are made at each temperature after the hold time

**Temperature/Humidity Cycling**

The loose coiled test sample is placed in the test chamber with sufficient length of fiber outside to reach the measurement equipment. After the test sample has equilibrated, the reference measurement is made at the initial temperature of +23°C. The fiber coil is temperature cycled (see Figure 1) while maintaining relative humidity levels as shown below:

**Temperature Cycle**

Figure 1



- Test Cycle: +23°C and hold to +85°C and hold - maintain 90-98% RH  
+85°C to 23°C drop - maintain 80-98% RH  
Below +23°C - uncontrolled RH
- Test Duration: 30 days
- Measurement Intervals: Day #0, 1, 3, 7, 14, and 30
- Measurements are taken at 23°C (±2°C)

### **Water Immersion, +23°C**

The loose coiled test sample, without dry lubricant, is placed in a bath of room temperature deionized water with sufficient length of fiber outside to reach the measurement equipment. The reference measurement is made at +23°C. The fiber coil is subjected to the deionized water bath as follows:

- Test Duration: 30 days
- Measurement Intervals: Day #0, 1, 3, 7, 14, and 30

### **Heat Aging, +85°C**

After a loose coiled test sample has equilibrated, the reference measurement is made at the initial temperature of +23°C prior to exposure to heat soaking. The fiber coil is then subjected to a constant +85°C heat soak as follows:

- Test Duration: 30 days
- Measurement Intervals: Day #0, 1, 3, 7, 14, and 30

### **References**

EIA/TIA-455-3A (FOTP-3), Procedure to Measure Temperature Cycling on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components.

TIA/EIA-455-72 (FOTP-72), Procedure for Measuring High Temperature-Humidity Cycling Aging Effects on Optical Characteristics of Optical Fibers.

TIA/EIA-455-74 (FOTP-74), Fluid Immersion Aging Procedure for Optical Fiber Optical Properties.

TIA/EIA-455-67 (FOTP-67), Procedure for Measuring High Temperature Aging Effects on Optical Characteristics of Optical Fibers.

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