

CORNING

# Reliability at the Core

## Hardened Connectors in the Outside Plant

When MSOs deploy fiber to the home (FTTH), every component is critical, but none more so than what is often considered to be a keystone component ... the hardened connector. These connectors, used alone or integrated into hardware products, must be able to protect against environmental factors common in the outside plant, such as extreme temperatures, moisture, humidity, and other harsh conditions. They also form the connections that can make or break a network. When deploying hardened connectors, reliability is crucial.

Corning is committed to the long-term reliability of our products, and nowhere is this more evident than in our hardened connector offering. We conduct extensive and rigorous approval testing before our products leave the factory to ensure every customer gets a product they can depend on for years to come. And the result? Since the early 2000s, we have helped connect more than 25 million homes across 21 countries using our hardened connector technology. Ensuring the reliability of our hardened connector products starts in the factory, and it's proven in the state-of-the-art networks that connect customers across the globe.

### OptiTap® Connector Environmental Performance Testing

Thermal Age: +85°C	7 days
Thermal Cycle: -40°C 100 cycles	7 days
Humidity/Aging: 75°C 95% RH	7 days
Humidity/Condensation: -10°C +65°C 14 cycles	7 days
Dry-Out Step: 24 hrs at +75°C prior to environmental tests	1 day
Post-Condensation Thermal Cycle: -40°C +70°C 100 cycles after dry-out step	
Vibration: 3 axes 1.5 mm peak-peak 10 to 55 Hz @ 45 Hz/min variation rate	7 days
Freeze/Thaw: Mated connector pair in water frozen and held at -5°C 10 cycles	
Water Resistance: 3 m head of water, no water intrusion	7 days

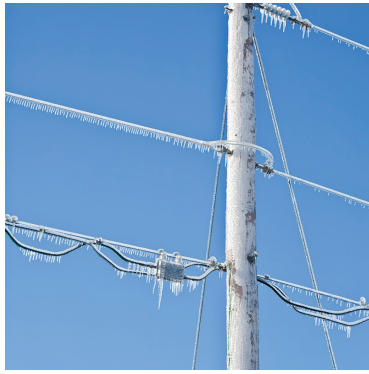
### OptiTap Connector Mechanical Performance Testing

Flex Test: +/-90°C 8 Cycles @ -40°C and +40°C	
Cable Torsion: +/-90°C 10 Cycles @ -40°C and +40°C	
Proof Test: 740N Plug-Cap	
Transmission Under Tensile Load: 44N @ 0 to 90° load angle @ -40°C	
Durability: 50 Matings	
Impact: 5 m drop 3 axes onto rigid surface	
Seal Under Load: Combination of water resistance and tensile load	7 days
Compression Test: 1330N @ -40°C and +40°C 15 mins	
Rodent Resistance: Hardness Rockwell R87	

### Approval Testing

We have dedicated more than 100,000 hours to testing our preconnectorized solutions, and our hardened connectors pass, and often exceed, the rigorous Telcordia outside plant reliability protocols. Telcordia GR-3120-CORE (for single-fiber OptiTap connectors) and GR-3152-CORE (for multifiber OptiTip® connectors) encompass all climactic regions in the United States, from Alaska to Arizona. While Telcordia is a U.S. standard, the severity of cold, heat, humidity, dust, and hurricane resistance is greater than any European specification for similar products.

Per Telcordia's environmental performance specifications, our hardened connectors are tested in severe environments, at temperatures from -40°C (-40°F) to +70°C (+158°F) and with extreme humidity, vibration, and water penetration requirements. While these conditions are extreme, the testing proves our connectors can withstand the environmental rigors found in any deployment. Our hardened connectors undergo testing in conditions more severe than what our customers will



## OptiTap® Connector Reliability Performance Testing 90 Days

GR-1221: 6.2.4 Extended Heat Aging +85°C	84 days
GR-1221: 6.2.5 Extended Humidity 75°C 95% RH	84 days
GR-1221: 6.2.7 Extended Thermal Cycling -40°C +70°C 100 Cycles	84 days
GR-326 4.4.4.4: Salt Spray 35°C 5%	7 days
GR-326 4.4.4.3: Airborne Contaminants	20 days
GR-771 5.4.9: UV Resistance UVB 313 nm 65°C 20% strength reduction	90 days
GR-771 5.4.10: Fungus Resistance ASTM G21 rating 0	21 days
GR-326 4.4.4.1: Dust Test SAE "Fine Arizona Road Dust" 39% 0-5 µm	7 days
GR-326 4.4.9: Ground Water Immersion (sect 5.3.8) Detergent, Chlorine, Fuel, Aqueous Ammonia	7 days

encounter even in the harshest settings, so you can be assured they will withstand the demands of your environment.

The mechanical and reliability performance of our hardened connectors is tested through a variety of procedures, including cable torsion, impact, UV resistance, and dust exposure. Like all of our testing procedures, your everyday deployment scenarios will not be as demanding. However, our products are tested in conditions far beyond typical so you will have no doubt they will last the lifetime of your network.

## Proof in Deployment

While our testing requirements are telling, the greatest proof of the reliability of our hardened connectors lies in the deployments. The testing procedures we developed during the infancy of FTTH have become standard in today's mass deployments. In the millions of homes passed with our preconnectorized products, more than 40 million hardened connectors have been deployed. More than 40 million connections, each one enabling transmission of the never-ending stream of data that consumers demand.

## Volume Deployment

Solution	Application	Number Shipped
OptiTap (Single-Fiber) Connectors	Drops	> 13.7 million
OptiTap (Single-Fiber) Adapters	Terminals, ONTs	> 27.3 million
OptiSheath® MultiPort Terminals (in ports)	Terminals	> 14.6 million
OptiSheath SCA/UCA Terminals (in ports)	Terminals	> 8.1 million
OptiTip® MT (Multifiber) Connectors	FlexNAP™ Tethers	> 1.5 million
FlexNAP System Access Points (in ports)	Terminal Systems	> 6.6 million
FlexNAP Terminal Systems	Terminal Systems	> 170,000

Note: Data as of 2015.

Visit [www.corning.com/mso](http://www.corning.com/mso) for more information.