OPTICAL CONNECTOR CONTAMINATION

What do the standards say?

The test procedures specified by 568-C require tools and procedures for **ensuring connector quality.**

- **End faces on cords and trunks shall be in accordance to IEC 6100-3-35.**
- **Use a microscope that is compatible with IEC 61300-3-35**
- **The microscope must use adapters that are compatible with connectors.**

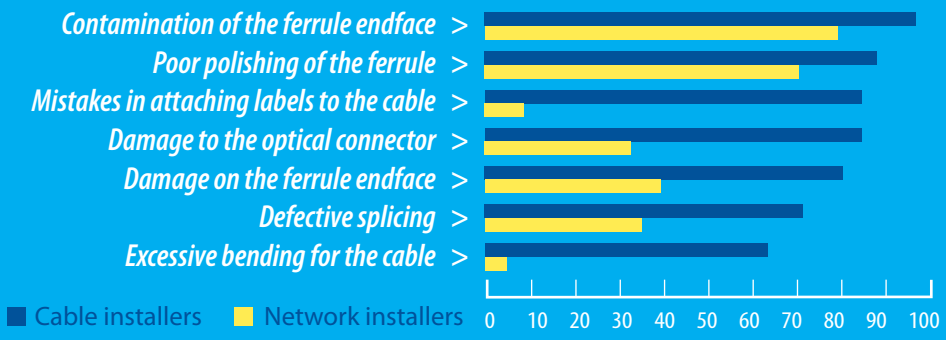
What is IEC 61300-3-35?

- **A set of requirements for Fiber Optic connector quality.**
- **Designed to guarantee insertion loss and return loss performance**
- **Used as reference between supplier & customer**
- **Used as condition for accurate testing of components and links.**

General Acceptance Criteria

Separate criteria for different connector types, and performance.

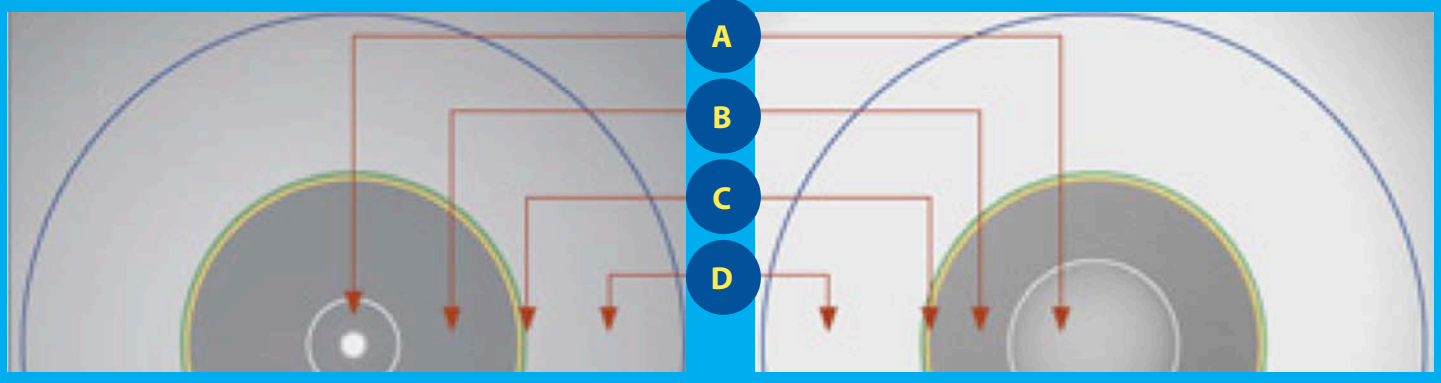
- **SM-UPC IL <= 0.30dB/RL>55dB**
- **SM-APC IL <=0.35dB/RL>65dB**
- **MM-PC IL <0.35dB**
- **Multi Fiber SM IL <0.50dB/RL> 60dB**
- **Multi Fiber MM IL <0.50dB**



In a recent study, 98% of installers (blue) and 80% of network owners (yellow) reported that issues with connector contamination was the greatest cause of network failure.

Source of data NTT

Example of fiber end faces and respective zones



Single mode UPC

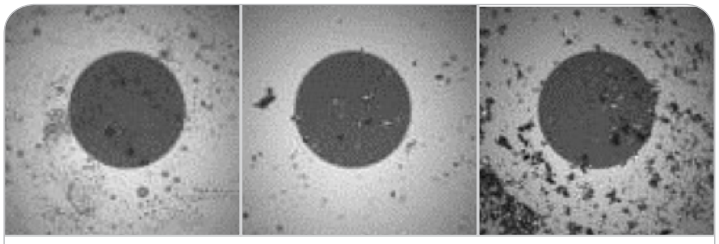
Zone Name		SCRATCHES	DEFECTS
A	CORE (0-25µm)	None	None
B	CLADDING (25-120µm)	No Limit<=3µm None> 3µm	No limit< 2µm 5 from 2-5µm None > 5µm
C	ADHESIVE (120-130µm)	No Limit	No Limit
D	CONTACT (130-250µm)	No Limit	None => 10µm

MM Connector

Zone Name		SCRATCHES	DEFECTS
A	CORE (0-65µm)	None	4<= 5µm None > 5µm
B	CLADDING (65-120µm)	No Limit<=3µm None> 5µm	No limit< 2µm 5 from 2-5µm None > 5µm
C	ADHESIVE (120-130µm)	No Limit	No Limit
D	CONTACT (130-250µm)	No Limit	None => 10µm

What happens if the optical connector end face becomes contaminated?

Examples of common contaminants adhering to end face:



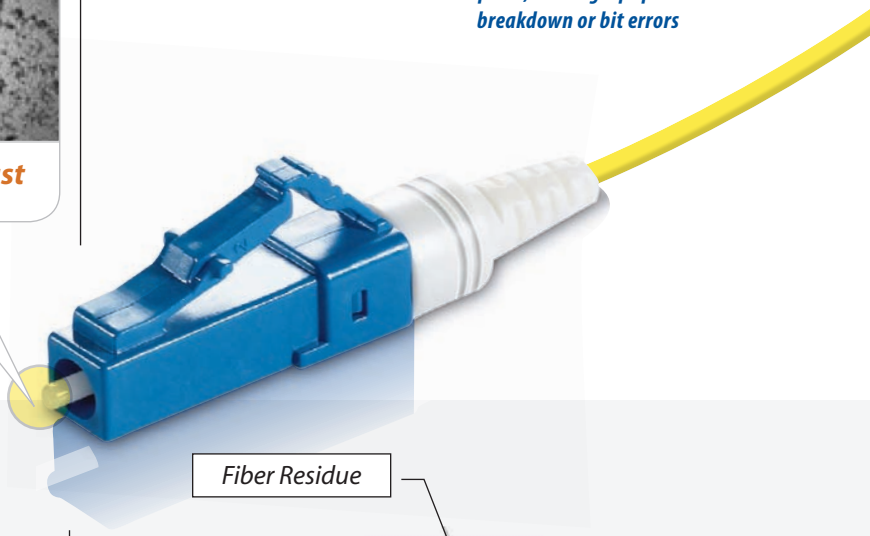
Hand Lotion *Fiber Residue* *Dirt and Dust*

Troubles caused by connector end face contamination

Light is transmitted poorly or not at all

Light is reflected back to connection point*

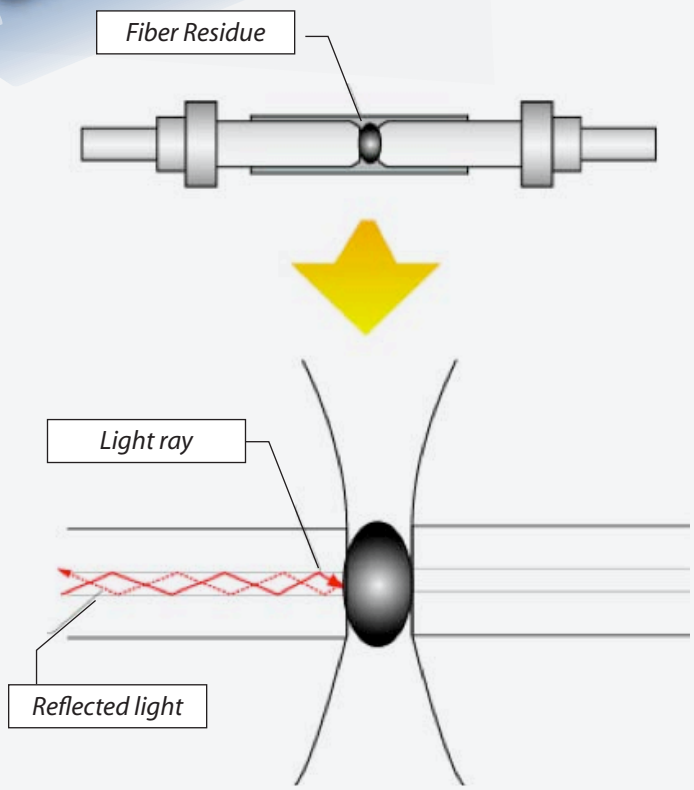
**returning to the transmission point, causing equipment breakdown or bit errors*



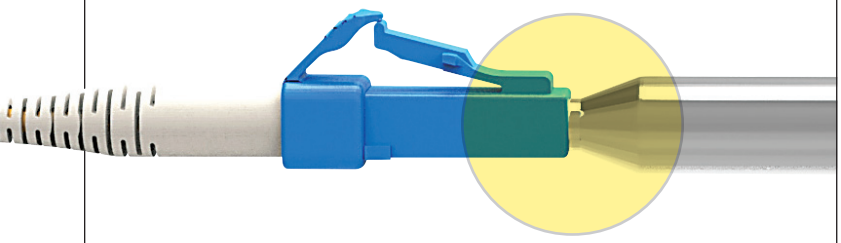
Optical connectors must have no contamination prior to mating

What can happen when the optical end face is dirty?
The beam of light may not be able to travel through the core. Optical connectors become contaminated from a variety of reasons. Usually 2-15 micron sized contaminants will have an impact on the signal transmission and could cause damage to the optical end face. The majority of network down time is caused by optical connector contamination.

Light beam is prevented from passing through due to contaminants on the end face, resulting in light reflection.

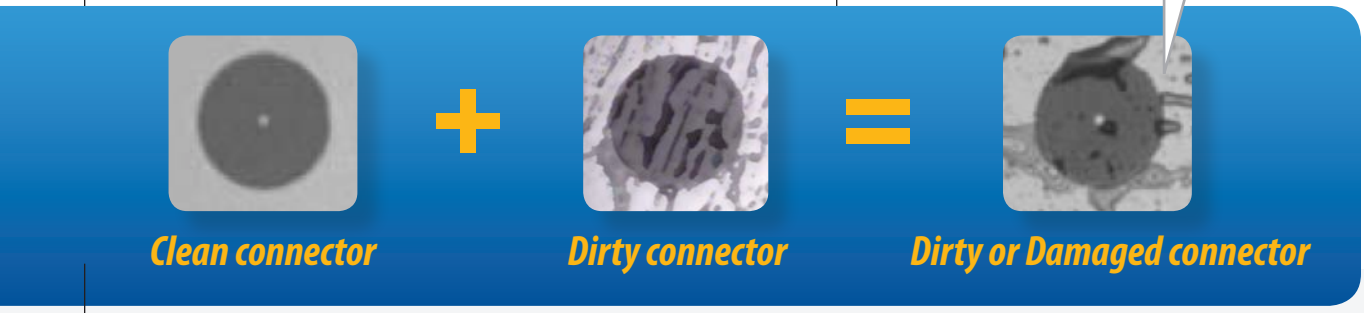


What can happen when contaminants adhere to the core?



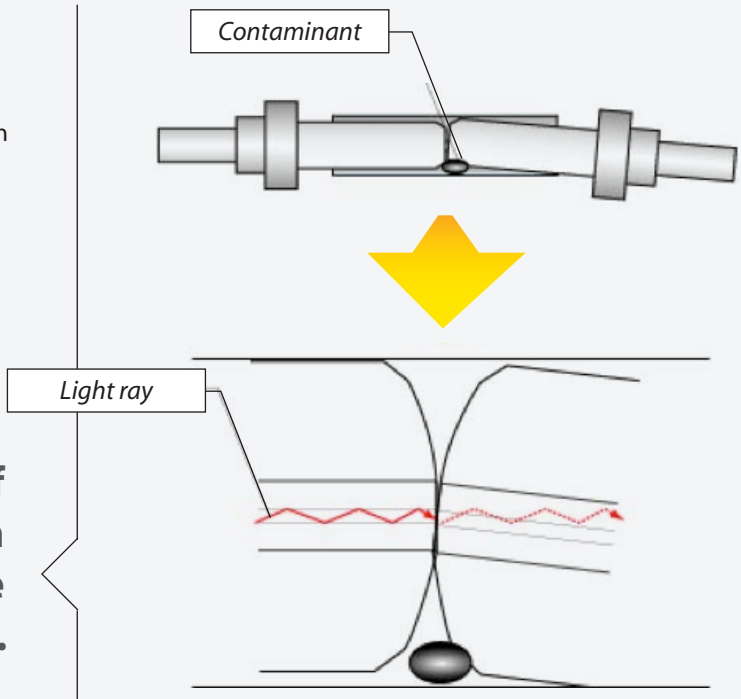
Mating a clean connector to a dirty connector

When the unclean optical connector is mated, the contaminant is forced into the ferrule and may become permanently damaged. In this situation, the damage cannot be removed with an optical cleaner.



When contaminants adhere to the core, they will cause an increase in signal interruption, an increased amount of insertion loss and degradation of return loss. Also, these kinds of contaminants can cause chips, pits, and scratches in the connector end face under the pressure of the physical connection. Large contaminants can result in gaps in the physical connection, resulting in increased loss. These kinds of contaminants can actually spread and migrate by the physical connection.

Contaminants at the side of the ferrule prevent light from properly passing through due to poor alignment.



Where High Power Lasers are used

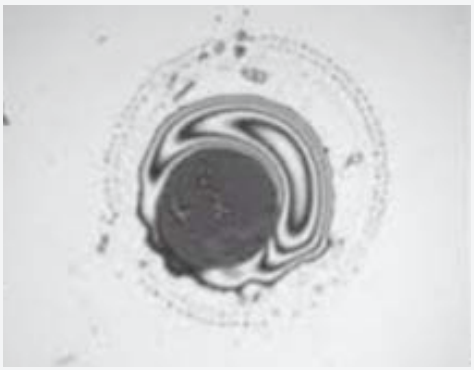
When residue or contaminants adhere to the optical connector, it will produce heat. This not only could melt the optical fiber, but could also destroy devices and equipment.

Core damage caused by high power laser in contact with end face contaminants

Why not IPA?

- Infinitely hydroscopic-self contaminating
- Slow drying (hangs in slit of alignment sleeve, and guide pin holes in MPO)
- Bottled IPA is easily contaminated during handling
- Leaves Residue

Residue remains after cleaning with IPA



The Smart Probe allows technicians to inspect the fiber endfaces, providing a high-definition image with a resolution up to 720px.

Smart Probe™ for Fiber Inspection

Wi-Fi STREAMING

Images are captured digitally and streamed on the monitor of any Android Tablet

Smart Solutions for the Fiber Optic Industry

Smart Probe™ for Fiber Inspection

The Smart Probe allows technicians to inspect the fiber endfaces, providing a high-definition image with a resolution up to 720px.

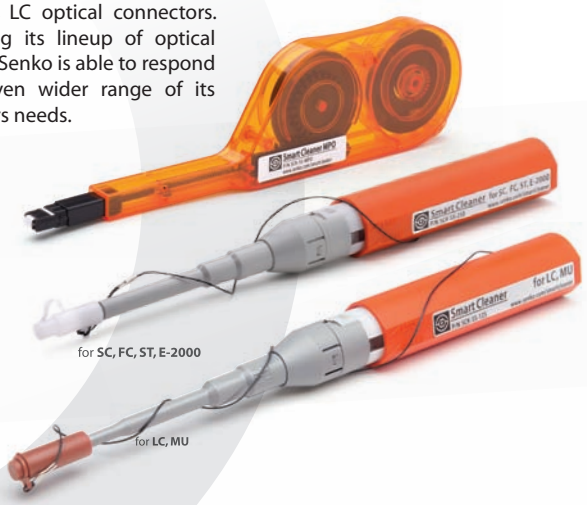
Images are captured digitally and streamed on the monitor of any Android Tablet or Smartphone.

INSPECT

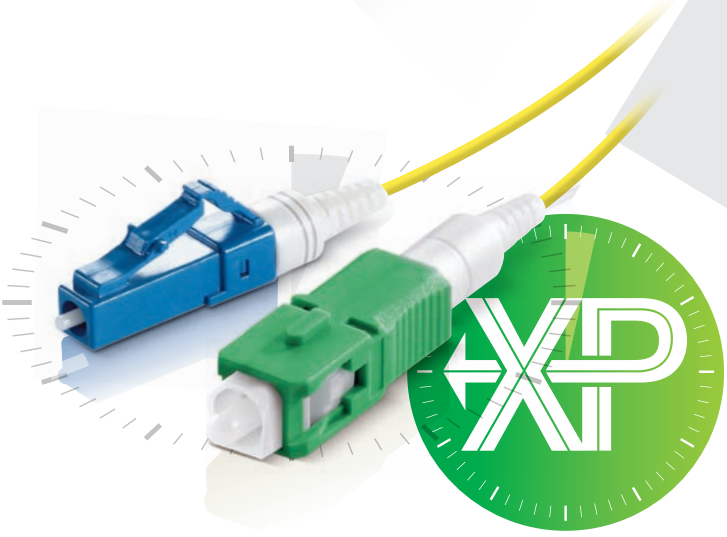
CLEAN

Smart Cleaner™ for Fiber Cleaning

Introducing the new cleaners for MPO, SC, LC optical connectors. Expanding its lineup of optical cleaners, Senko is able to respond to an even wider range of its customers needs.



CONNECT



XP Fit Plus™ Field Installable Connector

The XP Fit Plus is a pre-polished, pre-assembled connector that uses index matching gel. An internal mechanical grip, gently but effectively holds the fiber in place and can be installed in under 2 minutes. Without polishing or adhesives the XP Fit Plus makes on site installations quick and easy, diminishing the need for epoxy curing and hand polishing at the work site.