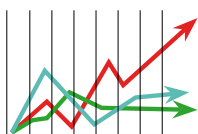


### Technical Specification

- Exceeds Telcordia GR-326 & Verizon FOC TPR 9409 requirement
  - Mechanical – GR-326 4.4.3.5 TWAL
  - Material Plastic– Anti fungus proven plastic material,
  - Material Zirconia – GR-326 4.4.4.5 Stabilized Zirconia ferrule
  - Optical – Typical IL of 0.05dB against Master (Premium Super low loss)
- IL Guarantee to meet IEC 61753-1 Random Mating requirement Grade A, B and C
- 4 Direction tuning feature to improve Random Mating IL (for Premium & Standard UPC)

# Introduction on Random Mating



**(According to IEC 61753-1, Examinations and measurements – Attenuation of random mated connectors)**

When an optical loss of a patch cord or a connector is measured, the term insertion loss (IL) is used.

Normally the jumpers are measured at the wavelength of 1310 and 1550nm, and a master jumper and a master adapter is used to determine and guarantee the loss.

It is known that when you mate the connector and check the IL with each other (Random mating), the IL will be higher compared to measuring against a master jumper.

A product such as the “master jumper” and a “master adapter” (which should be a perfect jumper and adapter that has absolute low loss) is used as a base to measure and define the insertion loss of the tested product.

It is commonly misunderstood that the IL you see tested with a master jumper is what you will be getting in the actual usage of the product such as in Racks, on devices and any other finished product.

When you use a master jumper and master adapter you are measuring your connection against a perfect ideal jumper. In actual usage you do not mate your jumper against a master jumper but with a normal jumper.

With this in mind IEC has introduced an insertion loss specification based on Random mating (IEC 61753-1 Attenuation of random mated connectors) which guarantee’s the IL of random mated connectors and categorized it in 4 different grades.

It is also known that you can see much more clearly the difference of a good connector (Jumper) and a bad connector by measuring the IL by the Random mating method

It is known that a connector that has a guaranteed IL of 0.5dB against a master can increase to as high as 1.00dB or higher in random mating.

SENKO has categorized its premium low loss connector, Premium connector and standard connector’s to the insertion loss not just against a Master jumper but also based on the IEC Random mating method to be able to offer a more realistic better performing product out in the field.



## Insertion loss IEC specification

IEC specifies Typical Attenuation to be less than 0.5 dB against reference plug using reference adaptor. SENKO has refined its connector designs to perform to a much higher level than that required by both IEC and Telcordia requirements.

Connector type	Insertion Loss against Master Jumper	Insertion Loss Random Mating	Insertion Loss Random Mating Tuned
Premium Low Loss SM UPC Connector	≤ 0.05dB Mean / ≤ 0.15dB Max	≤ 0.07dB Mean / ≤ 0.15dB Max	≤ 0.06dB Mean / ≤ 0.15dB Max
Premium SM UPC Connector	≤ 0.08dB Mean / ≤ 0.20dB Max	≤ 0.12dB Mean / ≤ 0.25dB Max	≤ 0.09dB Mean / ≤ 0.25dB Max
Premium Low Loss SM APC Connector	≤ 0.07dB Mean / ≤ 0.15dB Max	≤ 0.09dB Mean / ≤ 0.20dB Max	N/A
Premium SM APC Connector	≤ 0.10dB Mean / ≤ 0.25dB Max	≤ 0.14dB Mean / ≤ 0.30dB Max	N/A
Standard SM UPC Connector	≤ 0.12dB Mean / ≤ 0.30dB Max	≤ 0.25dB Mean / ≤ 0.50dB Max	N/A

Telcordia GR-326-CORE Requirement	≤ 0.20dB Mean / ≤ 0.40dB Max	N/A	N/A
IEC / JIS Requirement	≤ 0.25dB Mean / ≤ 0.50dB Max	N/A	N/A

\* For Maximum IL, 97% to meet the specification

\* For Random mating Grade A, specification is not determined yet. Above spec for Grade A is a proposed spec.

\* Insertion loss are only guaranteed when product terminated with SENKO’s recommended procedure.

RANDOM MATING IEC VALUE		SENKO UPC Connector	SENKO APC Connector	Typical Competitor
IEC Random Mating Grade A	≤ 0.07dB Mean*	Premium Low Loss SM UPC Connector	Premium Low Loss SM APC Connector	
	≤ 0.15dB Max*			
IEC Random Mating Grade B	≤ 0.12dB Mean	Premium SM UPC Connector	Premium SM APC Connector	
	≤ 0.25dB Max			
IEC Random Mating Grade C	≤ 0.25dB Mean	Standard SM UPC Connector	Standard SM APC Connector	Typical High Quality UPC Connector
	≤ 0.50dB Max			
IEC Random Mating Grade D	≤ 0.50dB Mean			Low cost quality UPC Connector
	≤ 1.00dB Max			

# Introduction to GR-326 TWAL TRANSMISSION WITH APPLIED TENSILE LOAD



In many applications and environments stresses are applied to connector assemblies during their working life. But connectors from all manufacturers do not work well under these stresses. Industrial specifications state different parameters that patchcord assemblies must conform too of which SENKO connectors are manufactured to be able to pass all these tests.

Specifically Transmission with Applied Tensile Load TWAL testing is required to determine if connectors perform to specific requirements according to industry standards whilst under a variety of tensile loads both straight pull and side pull tests.

Mostly this test is directed at the performance of the strain relief boot. Insertion Loss and Reflectance is measured at the 1310 nm, 1490 nm, 1550 nm, and 1625 nm wavelengths while applying each combination of load and angle (0° 90° 135°).

As stated in Telcordia GR-326 (4.4.3.5) the required parameters are shown below:

Load	0°	90°	135°
<b>Media Type I</b>			
0.25 kgf (0.55 lbf)	X	X	X
0.7 kgf (1.54 lbf)	X	X	
1.5 kgf (3.3 lbf)	X	X	
2.0 kgf (4.4 lbf)	X	X	
<b>Media Type II</b>			
0.25 kgf (0.55 lbf)	X	X	X
0.7 kgf (1.54 lbf)	X	X	
<b>Media Type III</b>			
0.25 kgf (0.55 lbf)	X	X	
0.5 kgf (1.1 lbf)	X	X	

Reinforced jacketed cable of any diameter used as jumper cordage, this may include simplex, duplex, or quad cable products.

Cable with a 900 µm buffer coating that may or may not be reinforced.

Connectors mounted on fiber with a 250 µm coating.

2mm boot TWAL  
0.25Kg (0.55lbf)/O



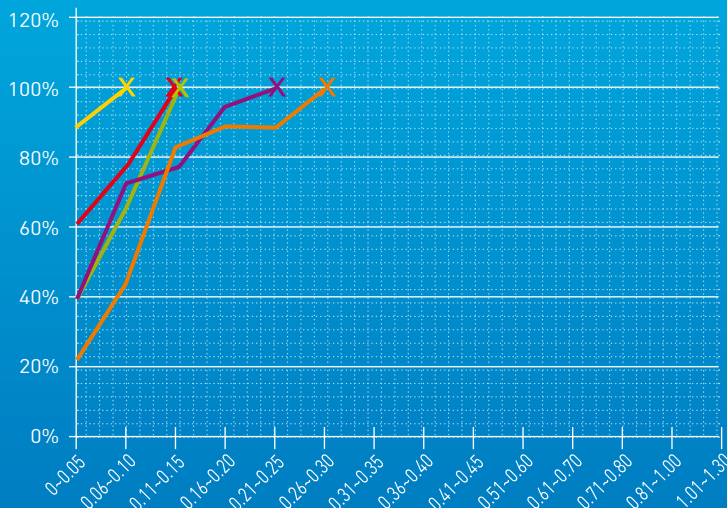
2mm boot TWAL  
2Kg (4.4lbf) / O



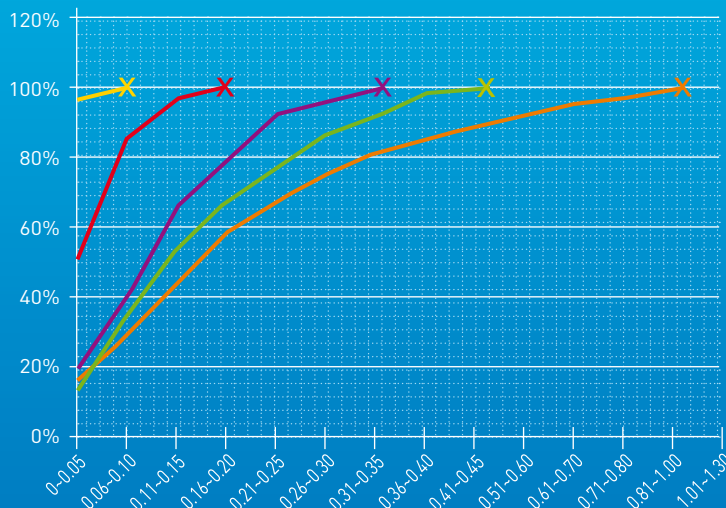
## Random Mating Testing

■ SENKO Low Loss    
 ■ SENKO Premium    
 ■ SENKO Standard    
 ■ High quality Competitor    
 ■ Low quality Competitor

Insertion Loss data against Master



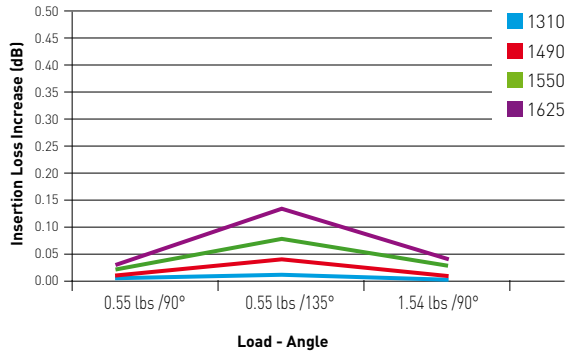
Random mating Insertion Loss



# Mini Boot

## SC-APC Mini BOOT 900 $\mu$ m

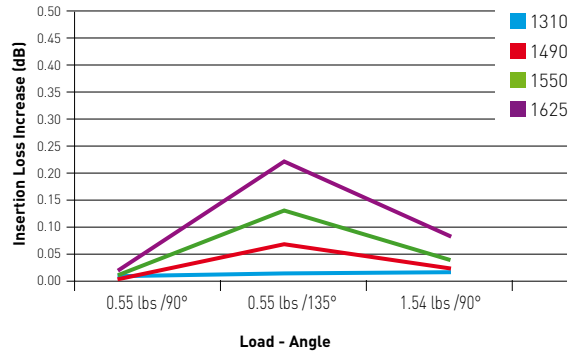
with G657-A2 (R-7.5) Fiber TWAL



# Standard Boot

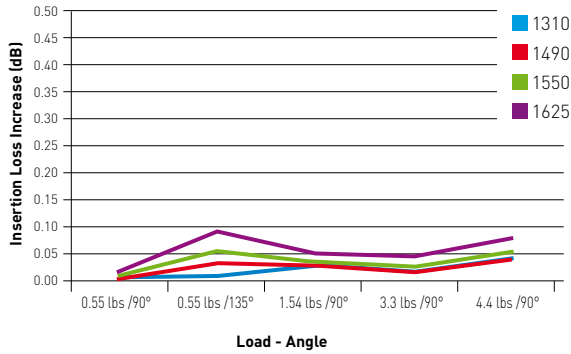
## SC 900 $\mu$ m Standard BOOT

with G657-A1 (R-15) Fiber TWAL



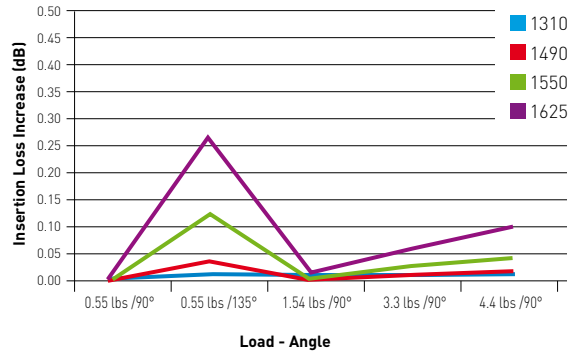
## SC Mini BOOT 2mm

with G657-A2 (R-7.5) Fiber TWAL



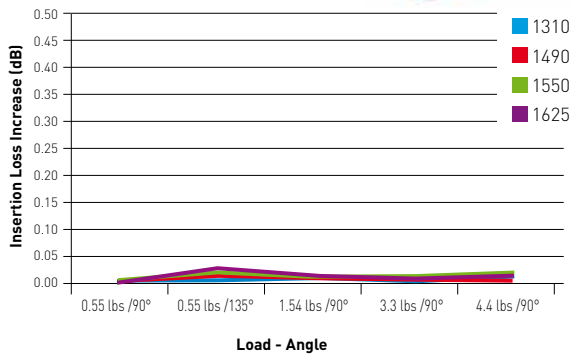
## SC 2mm Standard BOOT

with G657-A1 (R-15) Fiber TWAL



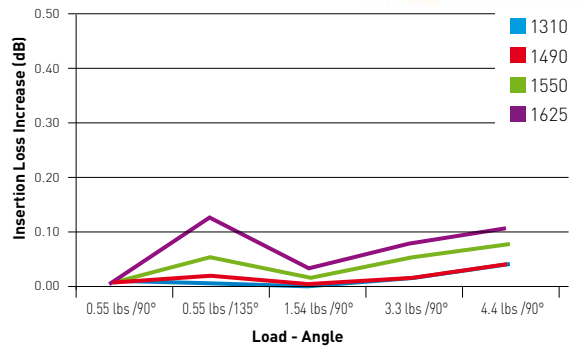
## SC Mini BOOT 3mm

with G657-A2 (R-7.5) Fiber TWAL



## SC 3mm Standard BOOT

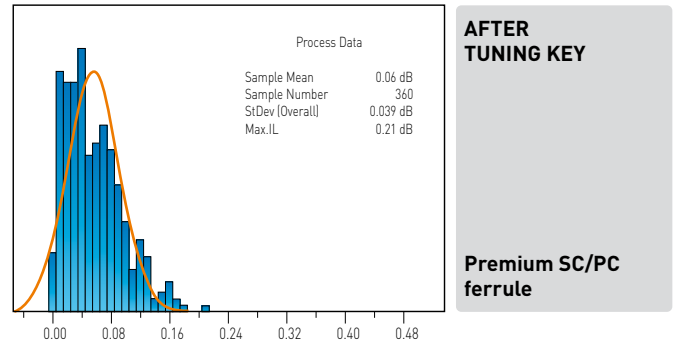
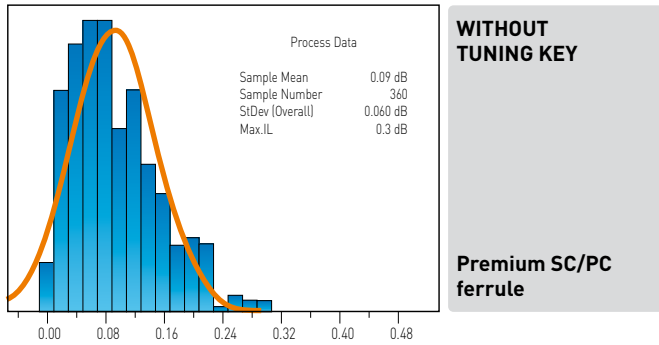
with G657-A1 (R-15) Fiber TWAL



# Tuning feature

Tuning feature for SC is available on Premium (UPC). Also for the SC it is in 4 different position tuning. Tuning the ferrule can improve Insertion Loss with Random Mating

## Process Capability of Random mating test:



# SC APC Apex offset Repeatability

## Repeatability of ferrule key error and Apex offset

SENKO's New SC APC Connector has significantly improved the repeatability of the Apex offset by reducing the Key error on it's connector.

Bad Apex offset can result to a big air gap in the connector which will result to bad IL and RL

Average Apex Offset Error $\Delta$		Average Key Error $\Delta$	
New Senko Premium SC APC	2.29 $\mu\text{m}$ (160 measurements)	New Senko Premium SC APC	0.032° (160 measurements)
Typical competitor SC APC	8.18 $\mu\text{m}$ (120 measurements)	Typical competitor SC APC	0.109° (120 measurements)

Note: Between each measurement ferrule end face has been cleaned by a lynt free cloth.

# Material

## Ferrule degradation

- Zirconia ferrule degradation can happen in high temperature and high humidity conditions.
- This issue was addressed in Telcordia GR-326 section 4.4.4.5 Immersion / Corrosion.
- Two major issues Ferrule flattening and Ferrule surface roughening.

Example of ferrule roughening from water immersion Test 85 Deg C, distilled water

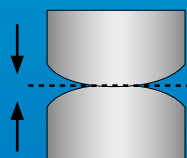


No ferrule roughening can be seen

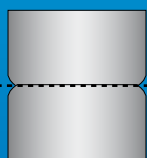


After the test, surface roughening can be seen

## Flattening Mating Pressure



Normal ferrule condition



Flattening caused by degradation when using bad quality ferrules

## Plastic Fungus testing

### Fungus Resistance

Over a period of time it is possible that Polymeric materials can grow fungus on the surface, (see image below of a Polymeric sample with fungus growth present) but according to the requirements of Telcordia GR-326 it stipulates that samples shall not support fungus growth per ASTM G21-96. A rating of 0 (zero) is required.

NOTE: This requirement applies to the connector (including boots) and adapter plastic components. SENKO premium connectors are manufactured using materials that do not support this fungus growth, after independent testing of SENKO connectors are rated at 0 (zero).



# New SC MINI Boot

900µm, 2mm and 3mm



The NEW SC MINI boot reduces overall connector length by 30% while maintaining superior cable support and bend radius as compared to traditional boot design. The short, flexible and compact design supports industry demanding TWAL standards.



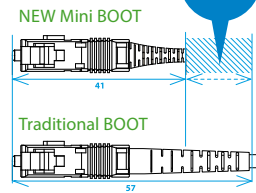
## HIGHLIGHTS

- 45% Shorter in boot length (2&3mm)
- Reduction of overall length from 58mm to 40mm (3mm, 2mm)
- Ideal usage for G657-A2 (R-7.5) fiber
- Meets Criteria of GR-326 TWAL (1310, 1490, 1550, 1625)

## FEATURES

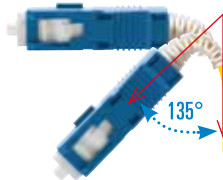
### Reduction in size

Compared to traditional SC

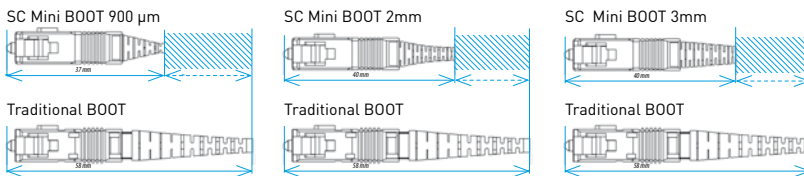


**-30%**

### Super Bending Strength

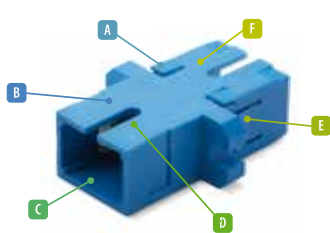


## SC MINI BOOT VS TRADITIONAL BOOT



# SC True One Piece Adapter

The new line of TOP Adapters with 4 anti rattle wings. Available in both flange and no flange configurations. The design has proven increased side loading performance over conventional adapters.



- A** Rattle Free
- B** One Piece Solid Body
- C** Shutter Ready
- D** High TG Hook
- E** Integrated Mount Clip
- F** Anti Fungus Plastic

## SC SIMPLEX



## SC DUPLEX



## FEATURES



### 4 anti-rattle wings

significantly reduce movement when snapped into panel



Integrated non metallic panel clip



External/Internal shutter capable

SENKO ADVANCED COMPONENTS, INC.

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