

On 29 June 2004 DSCC-VAT hosted a meeting at the DFAS conference center to discuss TFOCA-II style connector (MIL-PRF-83526/16) termini interchangeability. The meeting was attended by a total of 31 individuals including manufacturers, services, OEMs and others. Additionally one individual participated via teleconference. During the meeting Gene Ebert from DSCC-VAT provided a presentation on the pros and cons of termini interchangeability (starting at page 2). Note the final slide (page 8) was not discussed but can serve as a starting point for the next meeting. Following this, presentations were made by STRAN (starting at page 9), Fiber System International (starting at page 21), Amphenol (starting at page 37) and QPC (starting at page 50) on various aspects of the MIL-PRF-83526/16 style termini. Delphi (starting at page 54) provided a presentation on the NGCon terminus design and KITCO (starting at page 64) provided a presentation on their planned support of TFOCA and TFOCA-II through comprehensive tool kits. Following this, the services were polled on whether or not they thought termini interchangeability was desirable, and a unanimous decision for interchangeability was received. Wanchai Phalanukorn (PM TOCs) and Bill Van Nortwick (General Dynamics) expressed concern for support of hardware already in the field. This situation is to be addressed by each manufacturer. On behalf of CECOM Mr. James Allen agreed to revise the CECOM drawing (A3302584) to specify the MIL-PRF-83526/16 connector upon approval of the specification sheet.

A decision was made to meet again in the end of September or early October time frame to discuss the characteristics required for termini interchangeability. Note this is the earliest time because MIL-PRF-29504/16 is out for comment and comments are due back 18 August. It is intended that this meeting be conducted just before or after the next NGCon meeting at the DFAS conference center.

Summary of questions:

Termini marking

Connector marking

Shock test – adequate, or too severe (ferrules chattering against each other during shock)

Alignment sleeve – split or solid, retained, interchangeable

Mating force

Sealing material for NBC and wash down (Viton/EPDM)

Action items:

Gene Ebert – To send a copy of the attendance list to everyone. Sent 1 July 2004

Gene Ebert – To facilitate compilation of comments on MIL-PRF-29504/16 by sending a word copy of 155 form. Sent 8 July 2004

Dave Leight – Coordinate with Gair Brown on the next NGCon meeting to be back to back with next Termini Interchangeability meeting tentatively planned for end September, early October time frame. This is being done to save on travel expenses for those attending both meetings.

Jon Woodruff – Check on the impact of the proposed changes to dimensions PN, PQ and PZ in MIL-PRF-83526/16 (see compilation of comments numbers 12, 14 and 18).

Everyone – Share ideas about termini interchangeability characteristics (which characteristics and what are the tolerances).

# Agenda

- Intellectual property issues
- Fiber optic connector termini interchangeability
- MIL-PRF-83526/16 comments, summary
- Manufacturer's proposals
- MIL-PRF-29504/16
- Review and action items

# Intellectual property statement

- No specific legal protection within the working group.
  - All information presented in open forum
  - Companies responsible for clearly identifying applicable patents and patented design features
- Companies will provide the Government a royalty free license for any patents for essential design features\* for items produced and procured under the Government specification.
- Companies will license for commercial application any patents for essential design features\* at reasonable terms

\*Essential design features are characteristics essential to the interchangeability and interoperability as defined in the terminus and connector specifications.

# MIL-PRF-83526/16 style connector termini interchangeability

	Interchangeable	Non-interchangeable
Form, Fit & Function	Yes	Function only
Down time	30 minutes	30 + minutes
Replacement part(s)	One	Multiple
Procedure(s)	One	Multiple or extensive with several variations
Tools	One (set)	Multiple tools (sets)
Training	Simple and direct	Must learn all manufacturers parts and procedures

# MIL-PRF-83526/16 style connector termini interchangeability (cont.)

	Interchangeable	Non-interchangeable
Connector identification	Not required	Required
Document	Specification	Drawing
Cost	Fosters competition which lowers cost	Can vary extensively
Quality oversight	Government monitors quality and performance and is made aware of design changes - QPL	None

# MIL-PRF-83526/16 comments

- 6 - approx 1 full thread, +/- 1/8 thread
- 7 - Insert cap screw, socket head cap screw
- 11 - "PM" (insert cap protrusion) tolerance
- 12 - "PN" (plug body guide OD) tolerance
- 14 - "PQ" (coupling nut forward limit) tol.
- 18 - "PZ" (plug body ID) tolerance
- 44 - Insert material? Molded design?

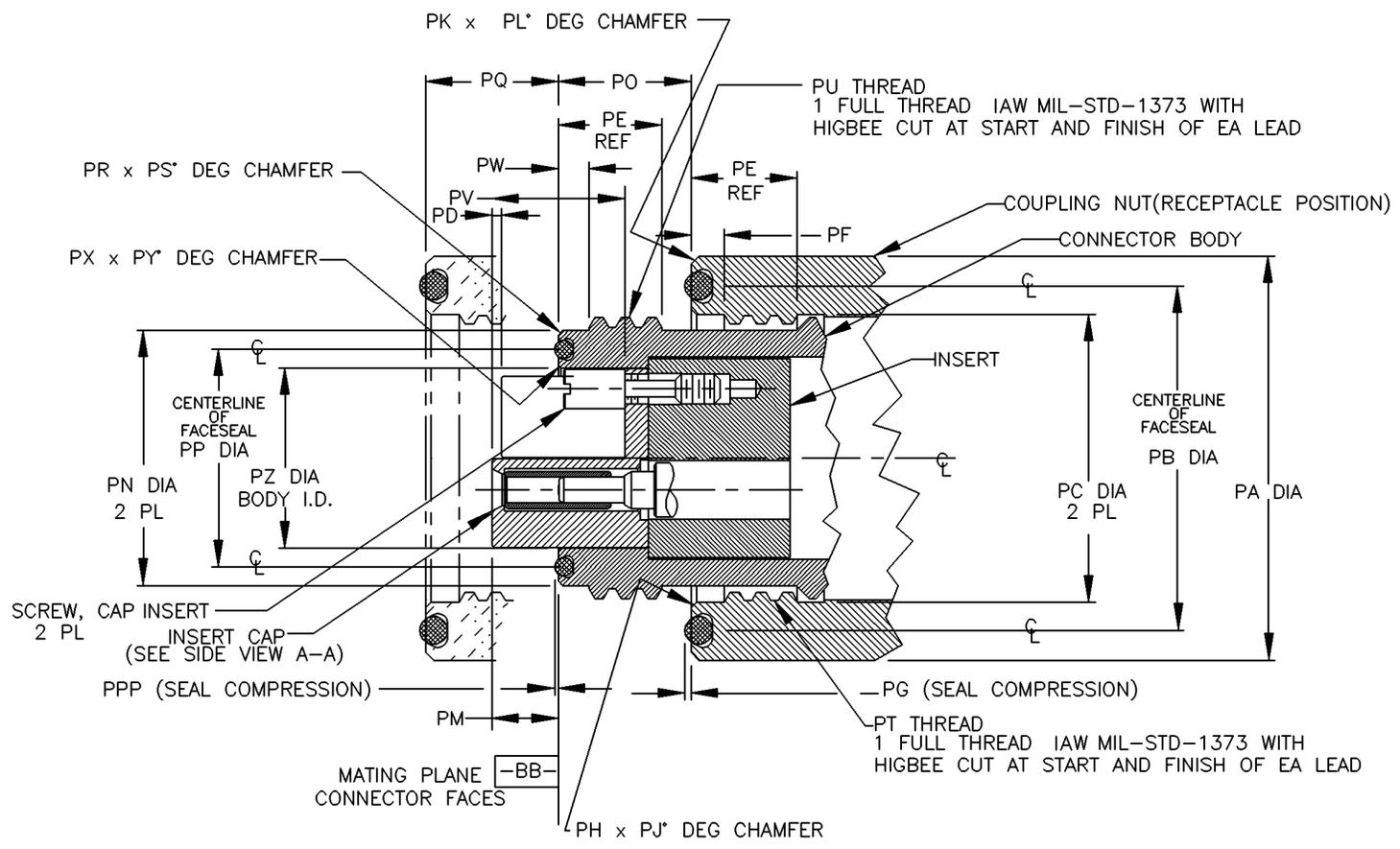


FIGURE 2. Plug interface dimensions.

# MIL-PRF-29504/16 critical characteristics

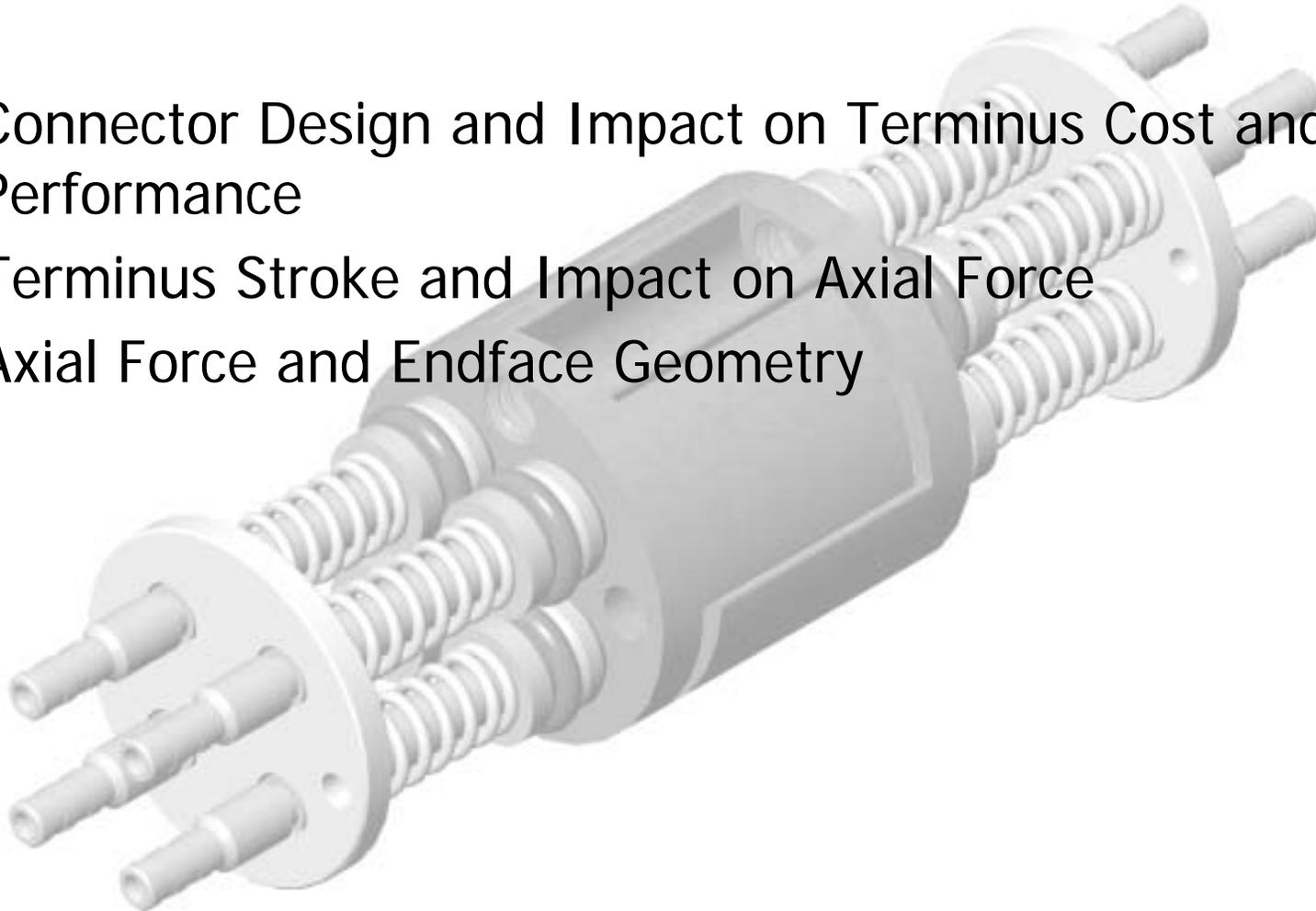
- Ferrule ID
- Ferrule end face configuration
- Spring force
- Termini  
compression/displacement/travel
- Crimp ring
- Alignment sleeve

# Comments on Draft MIL-PRF-29504/16

Bob Rubino  
Director of Technology and Product Development  
*STRAN Technologies*  
Naugatuck, CT  
203.729.2572

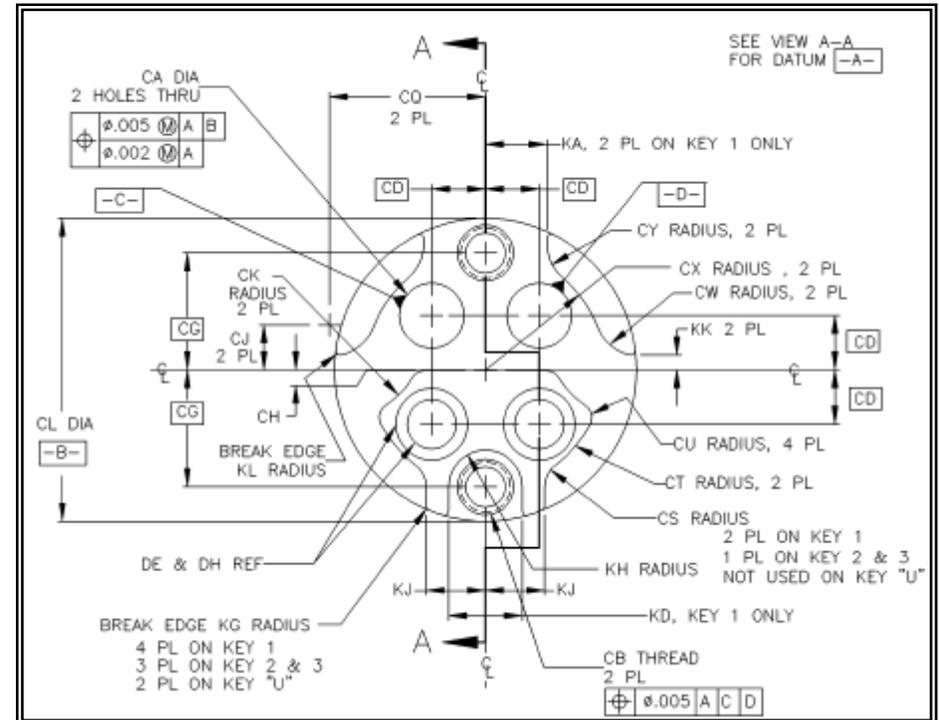
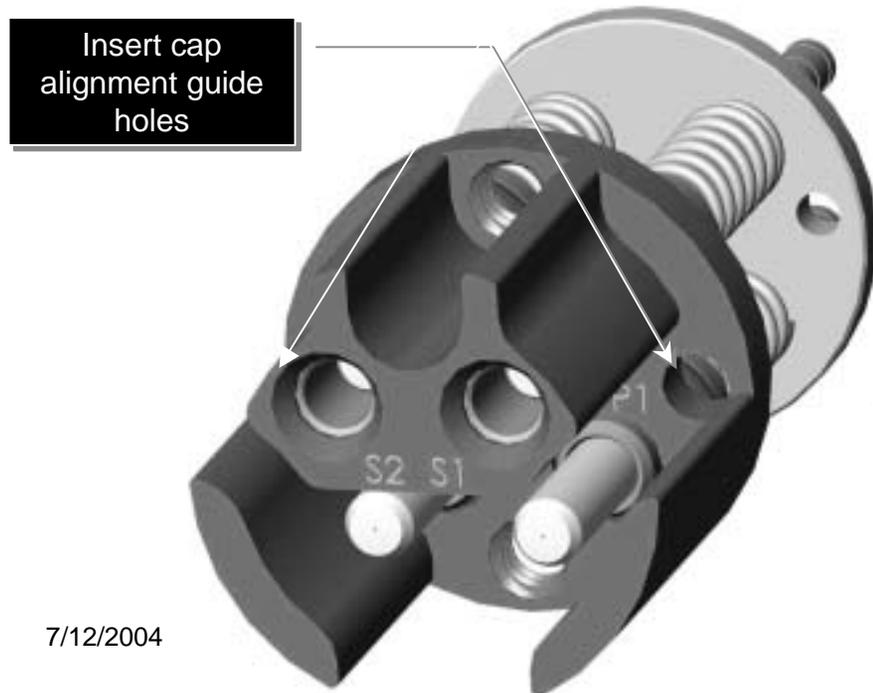
# MIL-PRF-29504/16 Performance and Cost Drivers

- Connector Design and Impact on Terminus Cost and Performance
- Terminus Stroke and Impact on Axial Force
- Axial Force and Endface Geometry



# Impact of Connector on Terminus Design

- Radii CT & CX determine translational misalignment of mated insert caps
- KK and/or CH determine "clocking" error



Draft MIL-PRF-83526/16

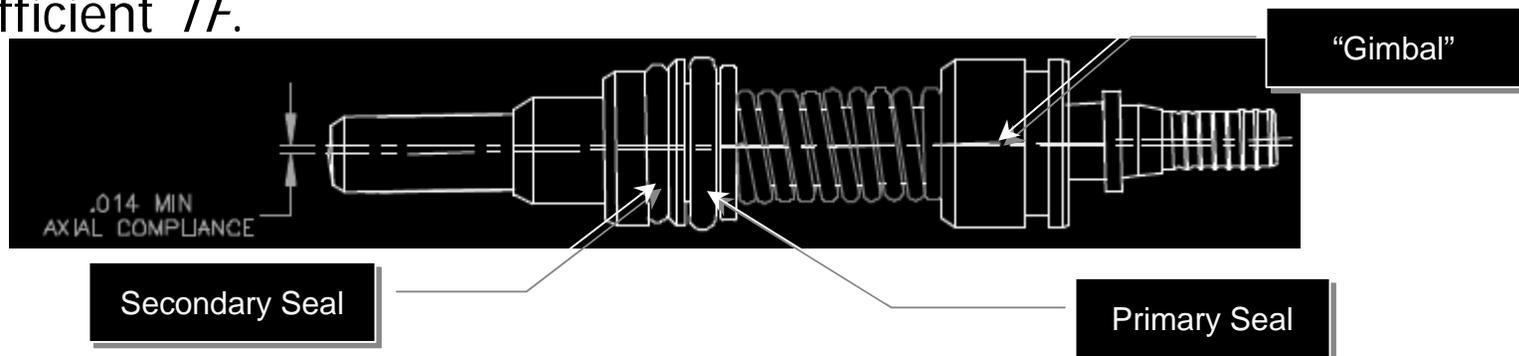
- Tolerance of guide pins / holes determines misalignment of Insert cap

# Geometric Tolerance Analysis

All units in inches	MIL-PRF 83526/16 Draft	STRAN Proposed
Insert Cap Translational Misalignment	0.012	0.007
Insert Cap Rotational Misalignment	0.003	0.001
Insert Cap / Insert Misalignment	0.010	0.001
Maximum Misalignment	0.025	0.009

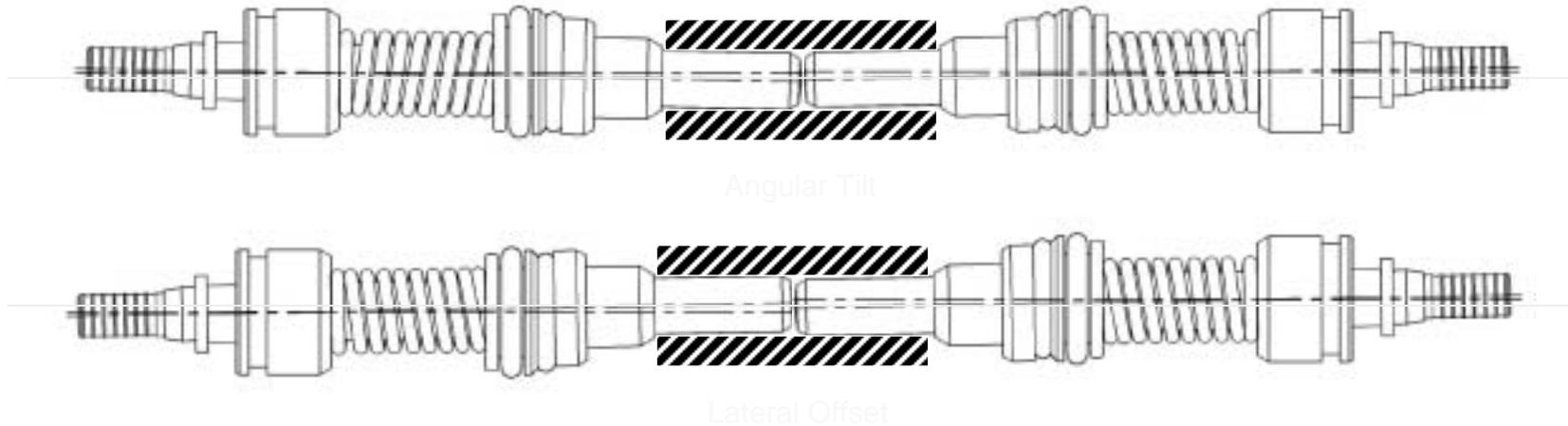
# Impact of the Connector on Terminus Design

- Terminus float allows precision alignment of optical fibers regardless of tolerance stack-up / environmental effects.
- Terminus Float,  $TF$ , must accommodate the tolerance stack-up of the mated insert caps and any misalignment between the insert and the insert cap.
- The proposed design of the insert cap is such that it requires a complicated (higher cost) terminus seal design so as to provide sufficient  $TF$ .



- Most importantly,  $TF$  and "axial compliance", are not necessarily the same thing.

## Solid Alignment Sleeve Impact on Singlemode Performance



- Per the proposed MIL-PRF-83526/16 spec, in comparison to a split alignment sleeve approach, reliance upon a solid alignment sleeve implies the terminus may experience:
  - ⊕  $\pm 0.01^\circ$  excess angular tilt
  - ⊕  $\pm 0.5\mu\text{m}$  excess lateral offset

# Singlemode Insertion Loss Performance

## ➔ Angular misalignment

$$L_{ang} = -10\log\left[e^{-T^2}\right], \text{ where } T = \frac{n_0\pi\omega_0 \sin \theta}{\lambda}$$

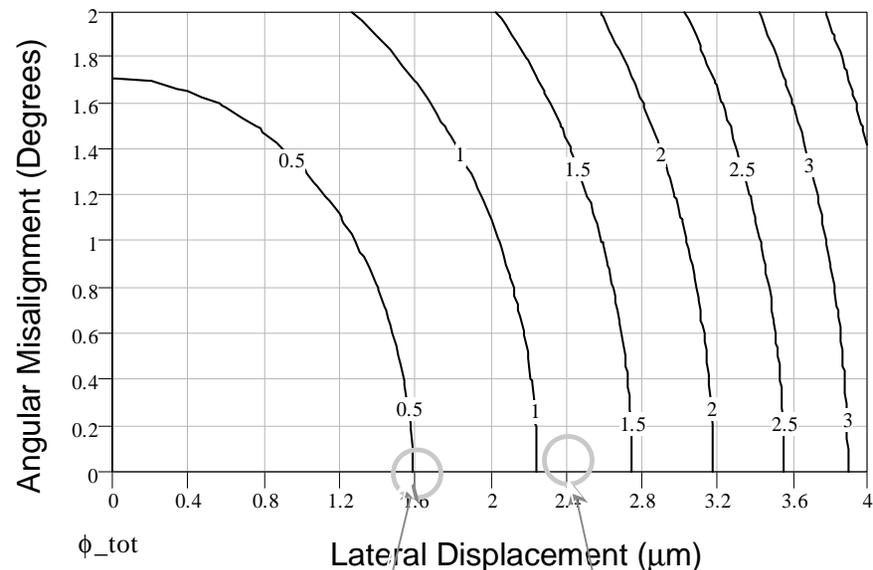
- ⊕ 0.01° leads to minor impact on IL

## ➔ Lateral misalignment

$$L_{lat} = -10\log\left[e^{-u^2}\right], \text{ where } u = \frac{x}{\omega_0}$$

- ⊕ 1 μm additional offset increases IL from 0.5dB to 1.2dB!
- ⊕ Becomes a significant issue for concatenated and higher bandwidth links.

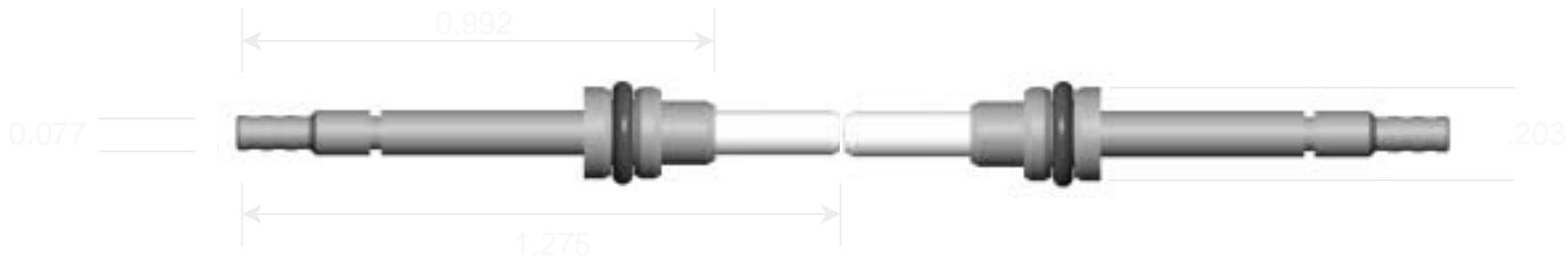
Constant Loss Curve for Angular and Lateral Misalignment Between Two Single-Mode Fibers



STRAN Baseline Design

Draft MIL-PRF-83526 Design

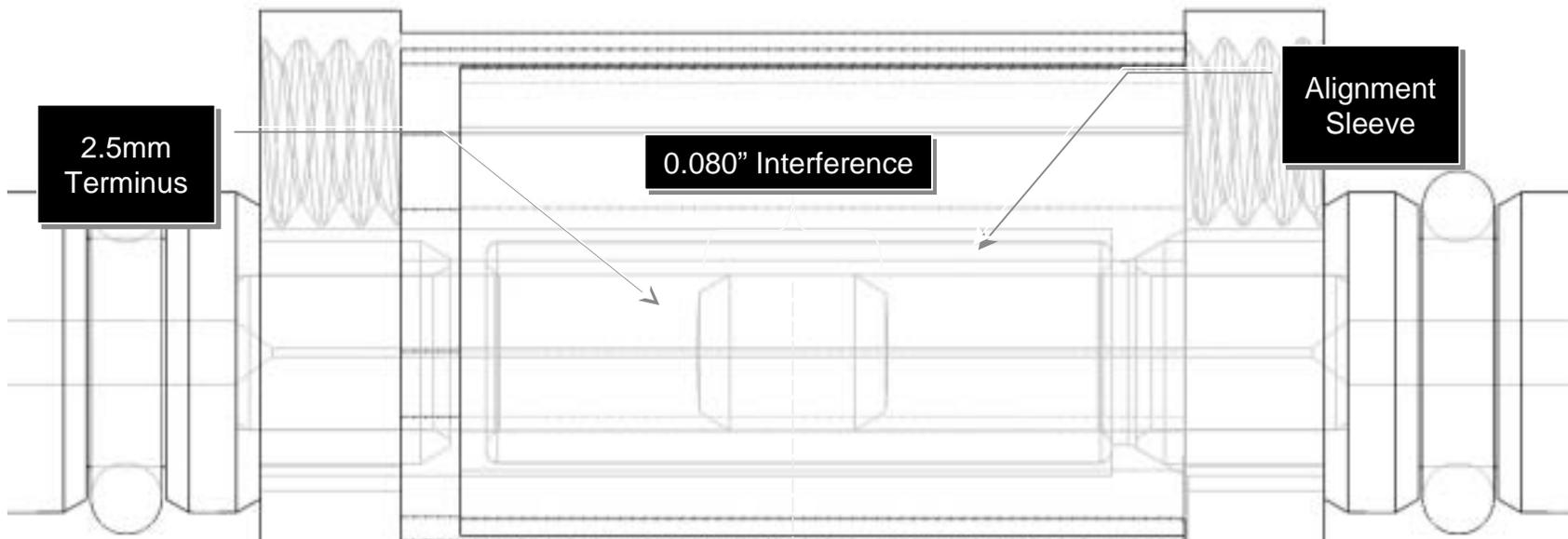
## Key features of STRAN design



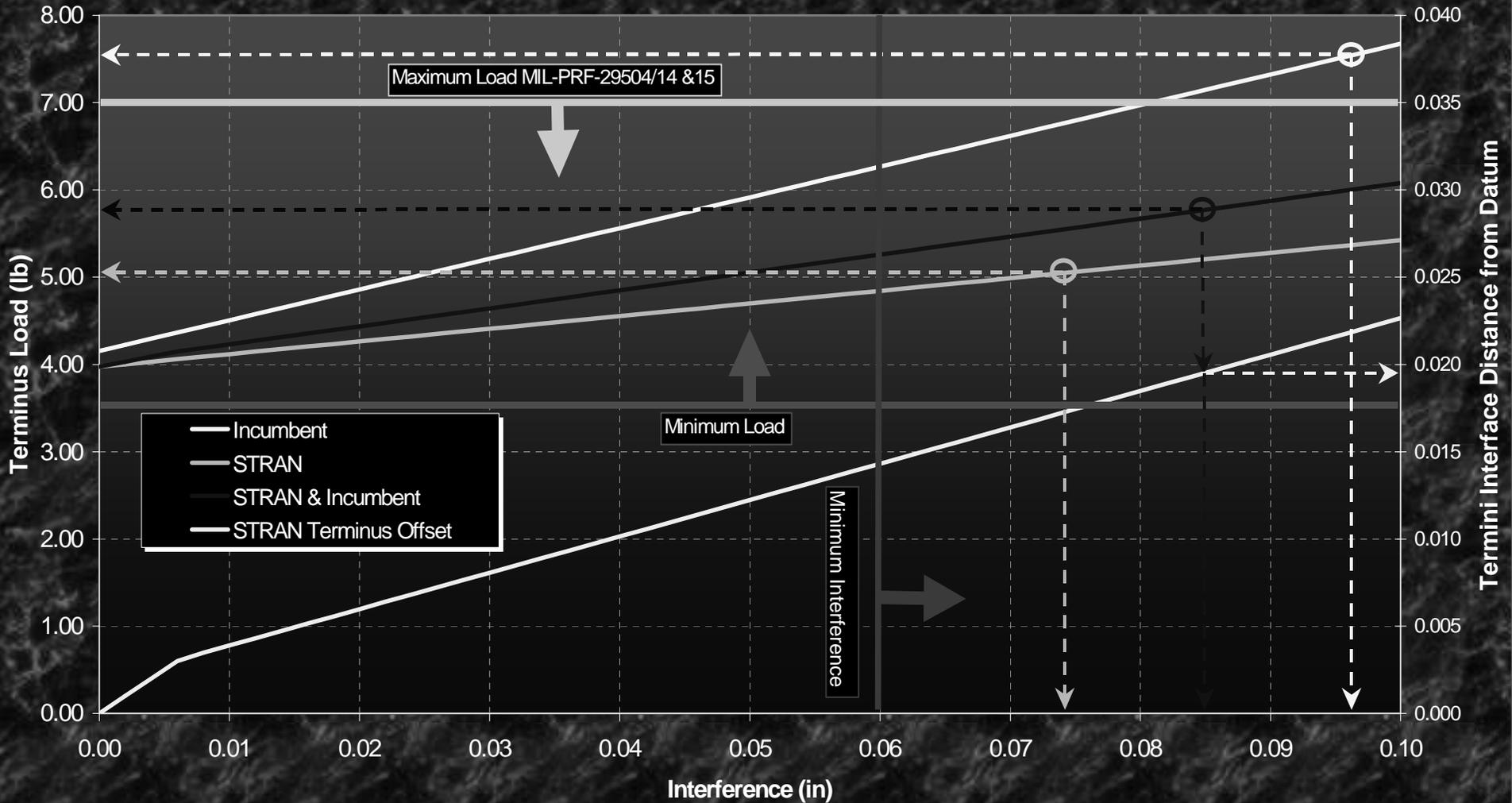
- Improved design of connector mate allows compliance of 'o'-ring to supply 0.009" of co-linear terminus float.
- 'O'-ring compliance enables one piece construction.
- Utilizes the same strength element crimp sleeve as MIL-PRF-29504/14&15.
- Split alignment sleeve enables lowest possible IL.
- Allows migration path to keyed (APC) termini.

# Terminus Interference

- Hermaphroditic connectors require termini compression / extension distance wrt mating plane, BB, must be equal.
- Terminus interference equals twice the compression distance.
- Maximize interference distance to maximize terminus rework cycles.
- Minimize interference distance to minimize variation on mating force.

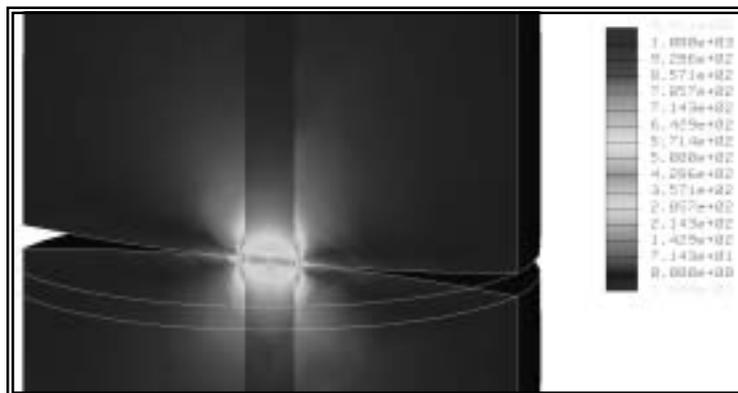
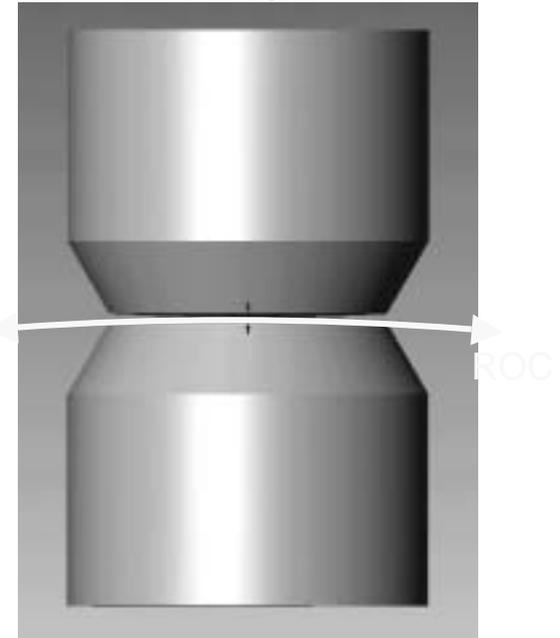


### MIL-PRF-29504/16 Terminus Loading & Interface Distance

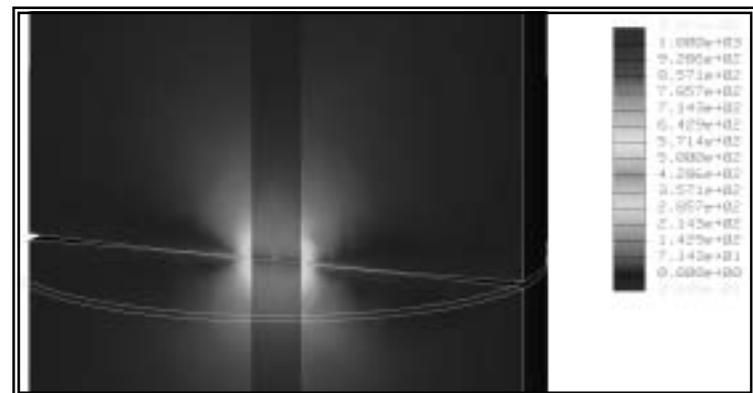


# Terminus Force / Endface Geometry

- ➔ 5lb and 7mm ROC
  - ⊕ Deformation Radius =  $82\mu\text{m}$
- ➔ 5lb and 25mm ROC
  - ⊕ Deformation Radius =  $125\mu\text{m}$
  - ⊕ Reduces stress in fiber by  $\sim 3.5\text{X}$
- ➔ Geometry and Spring load need definition and better control!



7 mm Radius of Curvature (ROC)



25 mm Radius of Curvature (ROC)

## Summary

- STRAN design cleans up the baseline MIL-PRF-83526 design to reduce complexity of the terminus whilst:
  - ⊕ Preserving intermateability with legacy product
  - ⊕ No increased tolerances ... no impact to manufacture cost
- STRAN terminus reduces part count and complexity
  - ⊕ Reduces manufacturing cost
  - ⊕ Increases performance and sealing reliability
  - ⊕ Provides for future migration paths to singlemode and APC
- Terminus reliability in harsh environment requires specification of terminus endface geometry, axial force and terminus stroke range.

# **M29504/16 Termini Interchangeability**

**June 29, 2004**

**Jon Woodruff  
Product Manager**

# **Interchangeable M29504/16 Termini Agenda**

- **Termini Interchangeability**
- **Termini Distribution/Fielded**
- **Termini Attributes**
- **Interface Features and Characteristics**
- **Testing and Risk Mitigation**
- **Support and Maintenance**
- **Intellectual Property – TFOCA-II<sup>®</sup> Termini  
Royalty Free for Government Use**
- **Summary**

## **Termini Interchangeability**

- All termini shall:
  - have the same part number and be interoperable among all manufacturers of M83526/16 and related connector style slant sheets.
  - be physically and functionally interchangeable.
  - utilize common tools, processes, and training for installation, removal, termination, and repair.
  - demonstrate sleeve interchangeability.

## **Termini Interchangeability**

- **Interchangeability does not preclude or limit multiple sources.**
- **Interchangeability creates supply and cost competition while maintaining known quality.**
- **Nearly all multi-source connectors have a termini interchangeability requirement for government use.**
  - **TFOCA**
    - **Biconic**
  - **M28876**
    - **M29504/14 and /15**
  - **D38999**
    - **M29504/4 and /5**
  - **NGConn**
    - **M29504/XX (To Be Determined)**
    - **Interchangeability Required**
  - **ARINC, AEEC, and SAE**

## **Termini Interchangeability**

- **Problems with non-interchangeability:**
  - **Logistics and costs of keeping separate inventory for conceivably ANY number of manufacturer's connectors.**
  - **Termination and repair procedures and tools could be substantially different.**
  - **Relies on knowledgeable end user to find out the part and procedural differences between "same" termini and connectors from different manufacturers.**
  - **Multiple tech orders.**
  - **Increased cost in supportability and maintainability.**
- **Depot or field repair and maintenance desirable and necessary.**
- **Standardize now prior to fielding additional non-interchangeable termini.**
- **Depot and forward repair activities are buying replacement components today.**

## **Termini Interchangeability**

- **Termini commonality benefits the end user**
  - **Ease of use**
  - **Cost savings**
    - **30%-50% savings realized for M29504 /14 /15 due to qualified competition**
  - **Single sets of:**
    - **Components**
    - **Procedures**
    - **Tools**
    - **Training**
- **Does the number of non-interchangeable connectors fielded justify increased future supportability and maintainability costs?**

# **FSI TFOCA-II<sup>®</sup> Termini Distribution**

- **164,000 FSI TFOCA-II<sup>®</sup> Termini Fielded**
  - **General Dynamics, Raytheon, Northrop Grumman, L-3, Alcatel, Argonne National Labs, NASA, US Army, USAF, USMC, US Navy, CECOM, BAE Systems, FEMA, GE, Lockheed Martin, Harris**
  - **Over 140 domestic and international direct customers**
    - **Including mining, broadcast, telecommunications, oil and gas, energy, and FMS**
  
- **Groups Trained for Fiber Systems' TFOCA-II<sup>®</sup>**
  - **US Army**
    - **Direct Unit Support Groups**
    - **Depot**
  - **USMC**
  - **US Navy**
  - **Government and Contractors**

## **Termini Attributes**

- **TFOCA-II<sup>®</sup> Termini**
  - **Industry Standard 10.5 x Ø2.5mm Ferrules (same as ST, FC and SC)**
  - **Single Fiber Terminus**
  - **Genderless**
  - **Rear Gimbal**
  - **Proven Retention System**
  - **SM/MM in any Terminus Position**
  - **Individual Terminus Sealing**
  - **Seals on Termini**
  - **Helical Termini Spring**

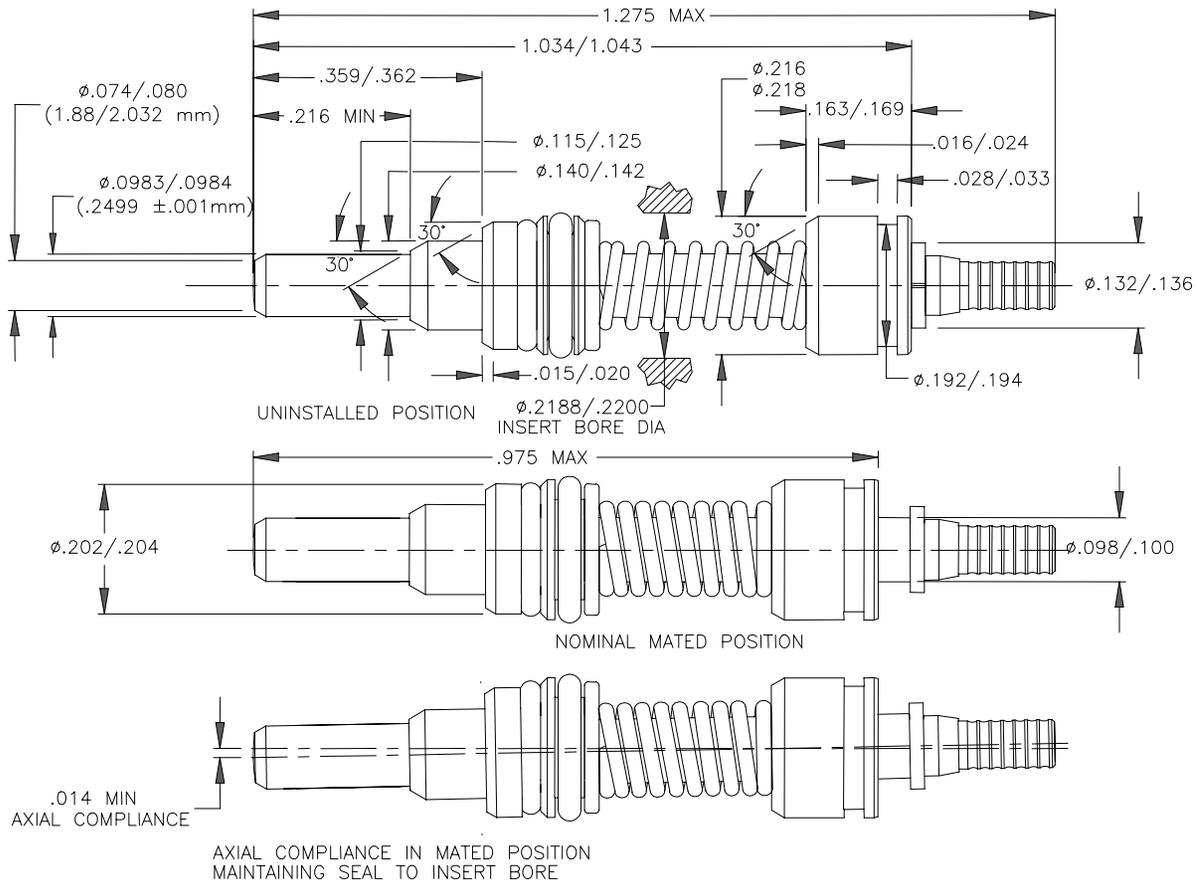
## **Termini Attributes**

- **TFOCA-II<sup>®</sup> Termini**
  - **Crimp Type Termini using a M83522/16 ST Crimp Sleeve**
  - **Epoxyless Crimp Strength Member Termination**
    - **Prevents Epoxy from Wicking Up Inside of the Cable Jacket**
      - **Fiber Cracking**
    - **Eliminates the need for Shrink Tubing**
      - **Excessive Exposure to Heat Can Damage the Fiber**
  - **Cost Effective Design**
    - **Helical Coil Spring**
    - **“Drop Off” Screw Machine Termini Components**
    - **Standard COTS type and size ceramic Zirconia ferrule**
    - **High speed manufacturing ability**
    - **Easy visual termini inspection**

## **Termini Attributes**

- **TFOCA-II<sup>®</sup> Termini**
  - **Developed and fielded tooling characteristics:**
    - **Insertion Tool does not Penetrate Sealing Areas**
    - **Tooling will not Damage Seal**
    - **Tool does not Stress Fiber during Installation and Removal**
  - **APC TFOCA-II<sup>®</sup> Termini Available**
    - **May want different slash sheets for the APC connector in the M83526 and the APC termini in M29504 specifications**
  - **Royalty free license for US Government related end use applications**

**TFOCA-II<sup>®</sup> Termini**



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# **TFOCA-II<sup>®</sup> Termini Interface Characteristics**

- **Ferrule OD  $2.499 \pm 0.001$  mm**
- **Ferrule ID's**
  - **126.0  $\mu\text{m}$  +1.0/-0.0  $\mu\text{m}$**
  - **127.0  $\mu\text{m}$  +1.0/-0.0  $\mu\text{m}$**
  - **142.0  $\mu\text{m}$  +1.0/-0.0  $\mu\text{m}$**
  - **230.0  $\mu\text{m}$  +4.0/-0.0  $\mu\text{m}$**
  - **Notes need to specify concentricity of ferrule hole diameter to ferrule OD not greater than 1  $\mu\text{m}$  for 126.0 ferrule and not greater than 5  $\mu\text{m}$  for 127.0 and greater internal diameter ferrules**
- **Termini lengths**
  - **Uninstalled pin & socket 1.034/1.043**
  - **Installed "ready-to-mate" pin .980/1.001**
  - **Installed "ready-to-mate" socket 1.005/1.032**
  - **Nominal Mated pin & socket .977 nominal**
  - **Fully compressed pin & socket .872/.891**
- **Nominal mated spring force 3.49 lbs**

## Validation Tests Completed/Risk Mitigation

Description			
•Cable Retention	•Mil-Std-1344, Mthd 2009, 182kg 1 min	•EIA-RS-455 (FOTP 6) 400 lbs, 1 min	•Mil-Std-1344, Mthd 2009, 182kg 1 min
•Temp Cycling	•DOD-STD-1678, Method 4010 (-46°C, 25°C, 71°C)	•MIL-C-49292/4 (CR) CR-CX-0200-001	•DOD-STD-1678, Method 4010 (-46°C, 25°C, 71°C)
•Storage Temp	•MIL-STD-810, Method 501 (High Temperature), Storage, Induced Temperature Conditions, 85°C, and Method 502 (Low Temperature), Storage, -55°C		•MIL-STD-810, Method 501 (High Temperature), Storage, Induced Temperature Conditions, 85°C, and Method 502 (Low Temperature), Storage, -55°C
•Humidity	•MIL-STD-1678, Method 4030, 10 cycles		•MIL-STD-1678, Method 4030, 5 cycles (incl. 3 cycles with low temp step)
•Mating Durability	•EIA-455-21, 500 mating/unmating cycles.	•EIA-455-21, 2000 mating/unmating cycles.	
•Vibration	•MIL-STD-810E, Method 514.4, Procedure II, 30 min min duration, loose cargo	•MIL-STD-1344, Method 2005.1, Minimum of .06 inch double amplitude or 10G, 15 min sweep from 10-500Hz, 12 times each in 3 axes.	•MIL-STD-810E, Method 514.4, Category 1, vibration profile per figures 514.4-1, -2, and -3. •Mil-Std-810E, Method 514.4, Category 8, test procedure I, figure 514.4-10 and table 514.4-All, 40 minutes per axis.
•Mech Shock	•EIA-RS-455-14	•EIA-RS-455-14, Condition A	
•Corrosion Resistance	•Mil-Std-1344, Method 1001		
•Crush Resistance	•Mil-Std-1344, Method 2008.1 (7 test @ 1250 newtons)	•EIA-455-26	
•Maintenance Aging	•Mil-Std-1344, Method 2002		
•Cable Sealing Flex	•MIL-STD-1344, Method 2017	•MIL-STD-1344, Method 2017, Procedure 1, 100 cycles	
•Impact	•EIA-455-2	•EIA-455-2	
•Dust	•Mil-Std-810, Method 510.4, Procedure I	•Run in conjunction with M28876 dust test per Mil-C-28876	
•Water Pressure	•1 m 48 hours, IL during&after	•MIL-C-83526, 1 meter of water for 24 hours	
•EMI		•15 kHz to 10 GHz, 80dB Shielding Effectiveness	
•Twist		•EIA-RS-455-36	
•Ice Crush/Freezing Water		•DOS-STD-1078, Method 4050	
•Immersion			
•Mud		•MIL-C-83526 /12	
•Flammability		•MIL-STD-1344, Method 1012	

## **Supportability & Maintainability**

- **Standardization and commonality drive down support and maintenance costs**
- **Standardization facilitates single product training class for timely deployment**
- **TFOCA-II<sup>®</sup> training classes developed**
- **Support tools and termination kits available**
- **Field/Depot/Manufacturer level repairs addressed**

# Intellectual Property

- Upon adoption of the FSI TFOCA-II<sup>®</sup> 2.5 mm fiber optic terminus system, FSI will immediately grant the US Government an exclusive royalty free license for FSI's TFOCA-II<sup>®</sup> 2.5 mm fiber optic terminus system, which has intellectual property features covered by registered patents. This royalty free license applies only to US Government defense related end use applications and only to the terminus system.
- Manufacturers interested in FSI's intellectual property rights for commercial applications will be required to obtain a license from Fiber Systems International. Fiber Systems International intends to provide these licenses to MIL-PRF-83526/16 participants, at commercially reasonable terms, provided the termini system is adopted as a commercial standard which requires multiple manufacturing sources.
- Fiber Systems International feels that this approach towards patent issues in regards to Fiber Systems International's intellectual property is fair to all manufacturers interested in MIL-PRF-83526/16 and has precedent as an acceptable solution for the Next Generation Connector activity.

## **Summary**

- **Standardization should be driven by:**
  - **Cost**
  - **Logistical efficiency**
  - **Support and maintenance**
  - **Multiple sources of supply**
- **Commonality drives down costs**
- **DoD, industrial, and commercial best practices dictate standardization and commonality**



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# Amphenol

Connecting People and Technology  
In The New Millennium  
TFOCAtwo

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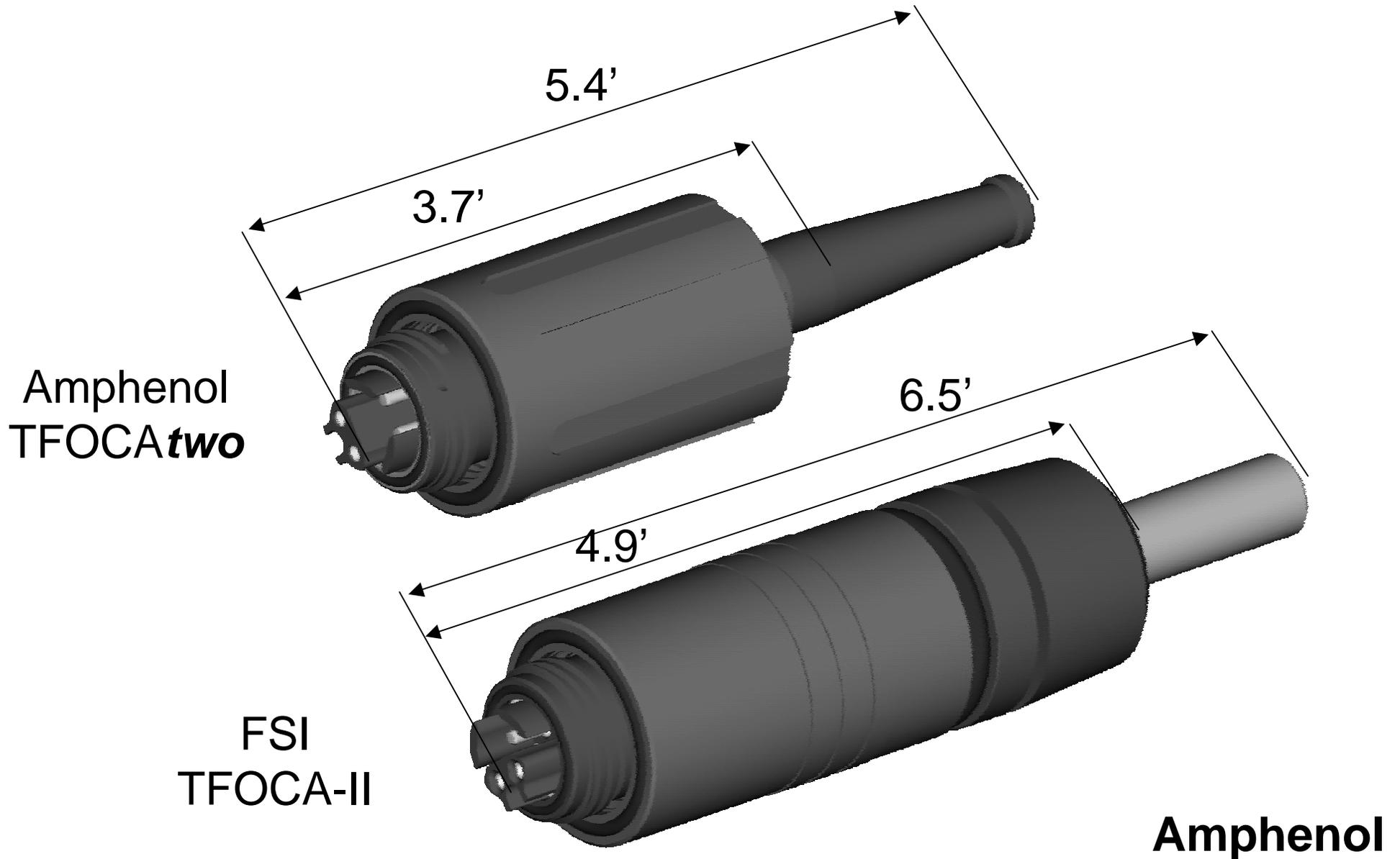
# AMPHENOL- TFOCA*two*

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- A Tfoca-II inter-mateable/Inter-mountable second source product offering a route to
  - Improved optical performance
  - Weight and size reduction
  - Improved cleanability, modular repair/replacement
  - Simplified reduced component design - cost savings
  - USA manufactured Cable assemblies (Texas)
- Retains existing features of Tfoca-II product
  - Hermaphroditic mating mechanism
  - Field cleanable, terminatable
  - Rugged construction - Thick Aluminium wall sections

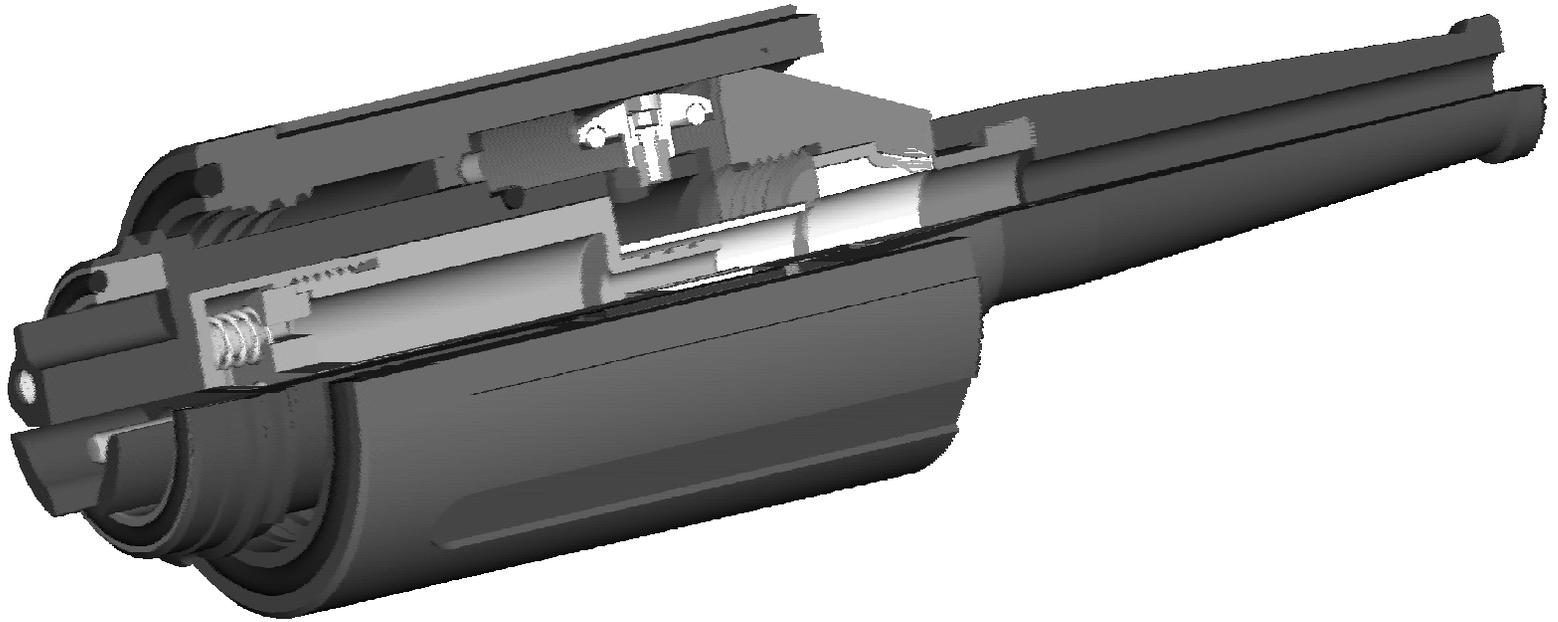
# Reduced size and Weight

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# Simplified Reduced Component Design

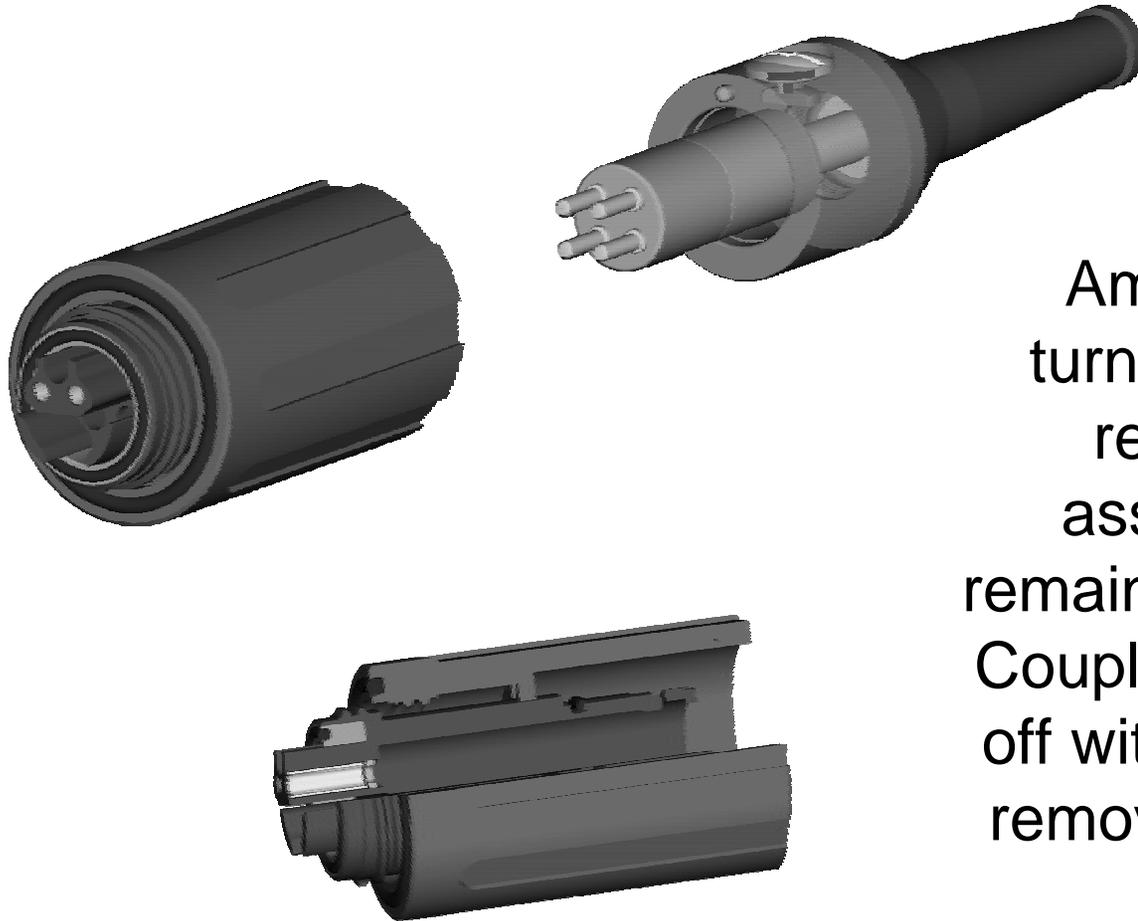
Amphenol  
TFOCA*two*



**Amphenol**

# Improved Cleanability

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Amphenol TFOCA*two*, a 90° turn with dime or screw driver to release the rear mono bloc assembly. Alignment sleeves remain captivated for flush cleaning. Coupling ring can then be threaded off with no tools to complete debris removal and NBC washdown from connector internal.

**Amphenol**

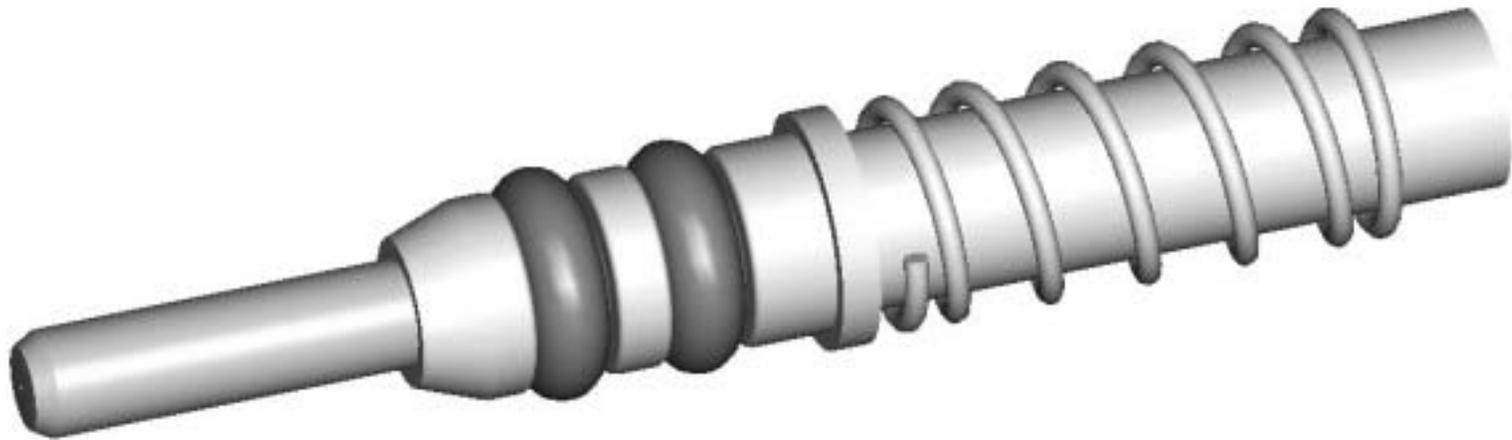
# Simplification & improved Performance

Amphenol TFOCA *two* has captivated Split alignment sleeve in a Stainless Steel limiter, improved optical performance, reduced components to hold and manage.



**Amphenol**

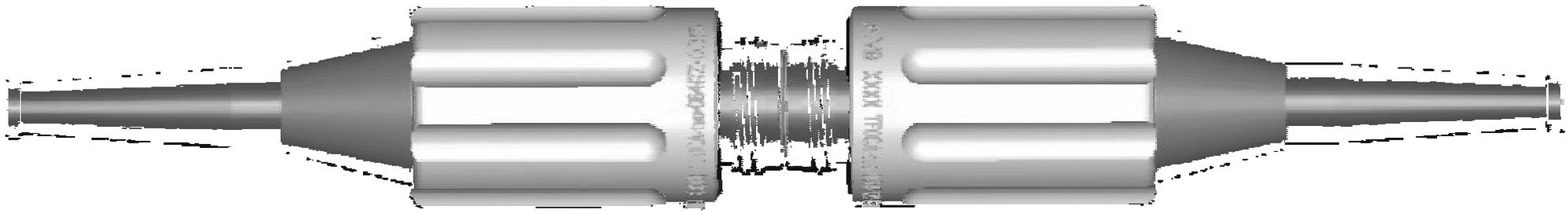
# Simplification & improved Performance



Amphenol TFOCA *two* Receptacle Termini has integral crimp ferrule and reduced number of components. The sealed termini are retained by rear body and lock nut.

**Amphenol**

# AMPHENOL PLUG TO AMPHENOL PLUG



## INSERTION LOSS

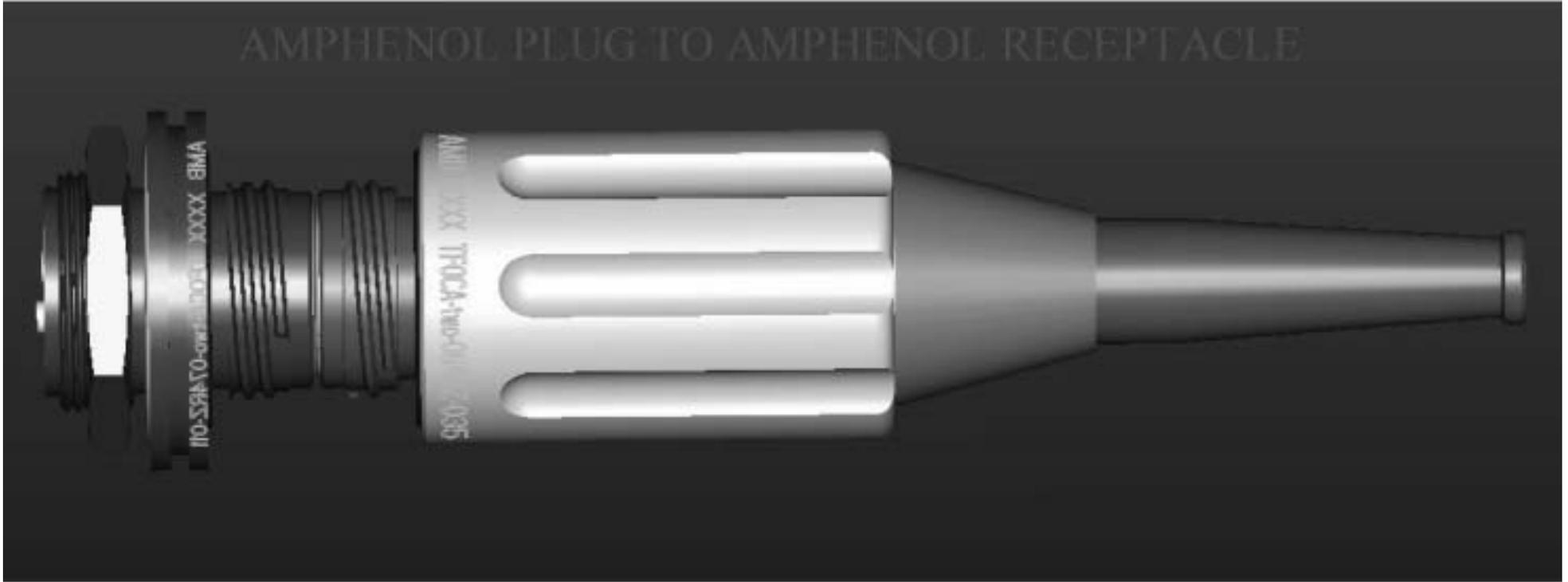
S1 0.23

S2 0.50

P1 0.13

P2 0.41

AMPHENOL PLUG TO AMPHENOL RECEPTACLE



INSERTION LOSS

S1 0.25

S2 0.28

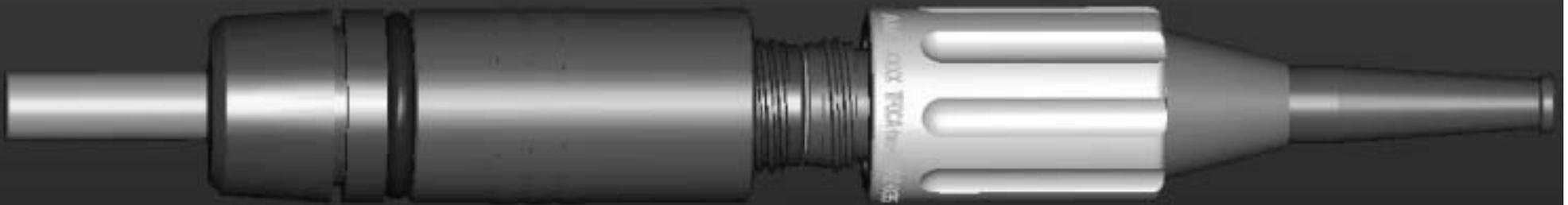
P1 0.13

P2 0.35

**Amphenol**



# FSI PLUG TO AMPHENOL PLUG



## INSERTION LOSS

S1 0.21

S2 0.35

P1 0.28

P2 0.46

**Amphenol**



# Summary

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All the Legacy benefits of the Existing TFOCA-II product with all the benefits of a modern design construction.

Easier to handle, Terminate and deploy reliably.

Cost, Size, weight and reliability benefits.

All the Benefits of the Worlds Largest Military connector manufacturer manufactured locally in each country.

**Amphenol**

# MIL-PRF-83526/16 style CONNECTORS



QPC Fiber Optic, Inc.

# INSERT ASSEMBLY:

## 1. INSERT WITH ONE MOUNTING SCREW AND ONE ALIGNMENT PIN



- REPLACE MOUNTING SCREW AT UN-PROTECTED AREA WITH AN ALIGNMENT PIN TO AVOID DAMAGE TO THE FERRULES
- FIELD ASSEMBLY IS FASTER AND EASIER
- QPC IS ALSO LOOKING AT VARIOUS WAYS TO MAKE THE ALIGNMENT SLEEVES STAY IN THE INSERT DURING DISASSEMBLY.



QPC Fiber Optic, Inc.

915 Calle Amanecer, Suite D – San Clemente, CA. 92673-6215

Phone: (949) 361-8855 – Fax: (949) 361-8949

# TERMINI ASSEMBLY:

2. TERMINI ASSEMBLY IS EASY TO DISASSEMBLE:



- TERMINI CAN BE POLISHED INDIVIDUALLY



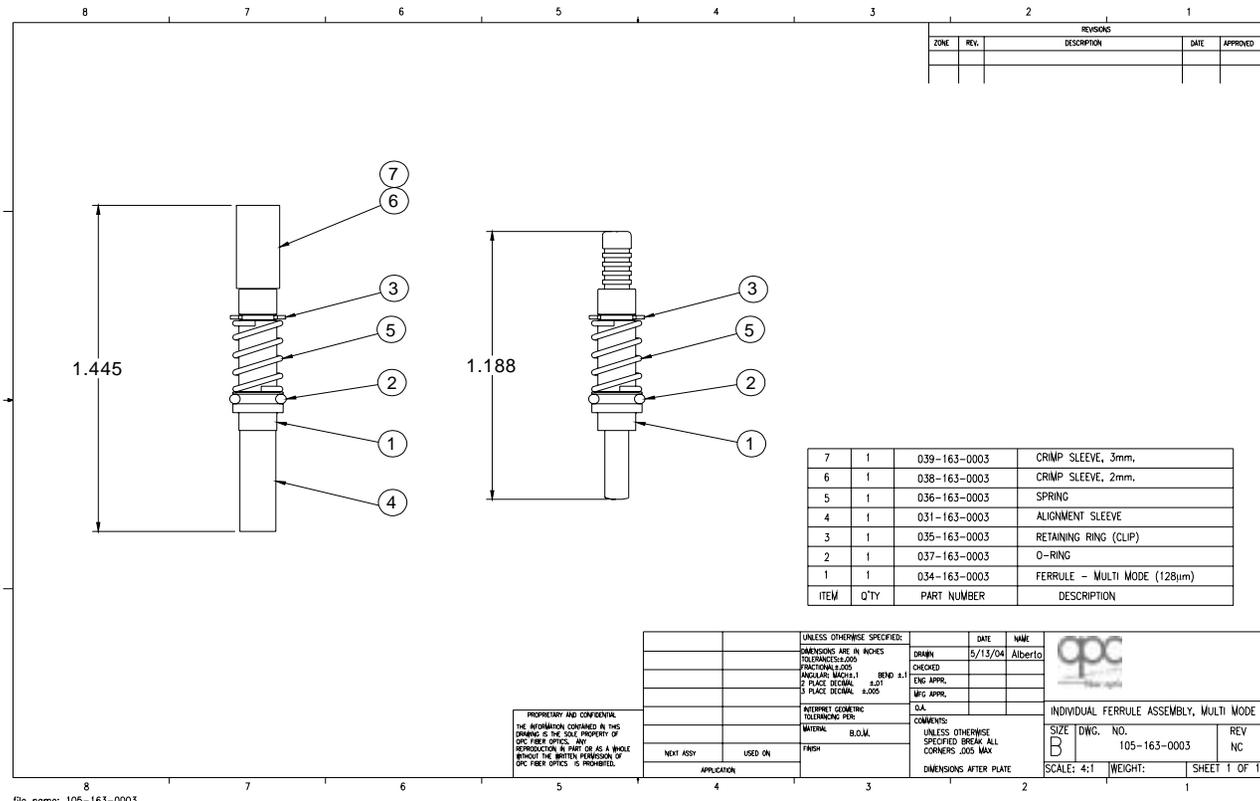
QPC Fiber Optic, Inc.

915 Calle Amanecer, Suite D – San Clemente, CA. 92673-6215

Phone: (949) 361-8855 – Fax: (949) 361-8949

# TERMINI DESIGN:

- HERMAPRODITIC, SPRING-LOADED INDIVIDUAL TERMINI
- ENVIRONMENTALLY SEALED / FLOATING
- HIGH PRECISION PC AND APC ZIRCONIA FERRULE
- RUGGEDIZED COST EFFECTIVE DESIGN



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# **DELPHI**

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***Next Generation  
Heavy Duty Fiber Optic Connector***

**THE TERMINUS SYSTEM**

FEATURES

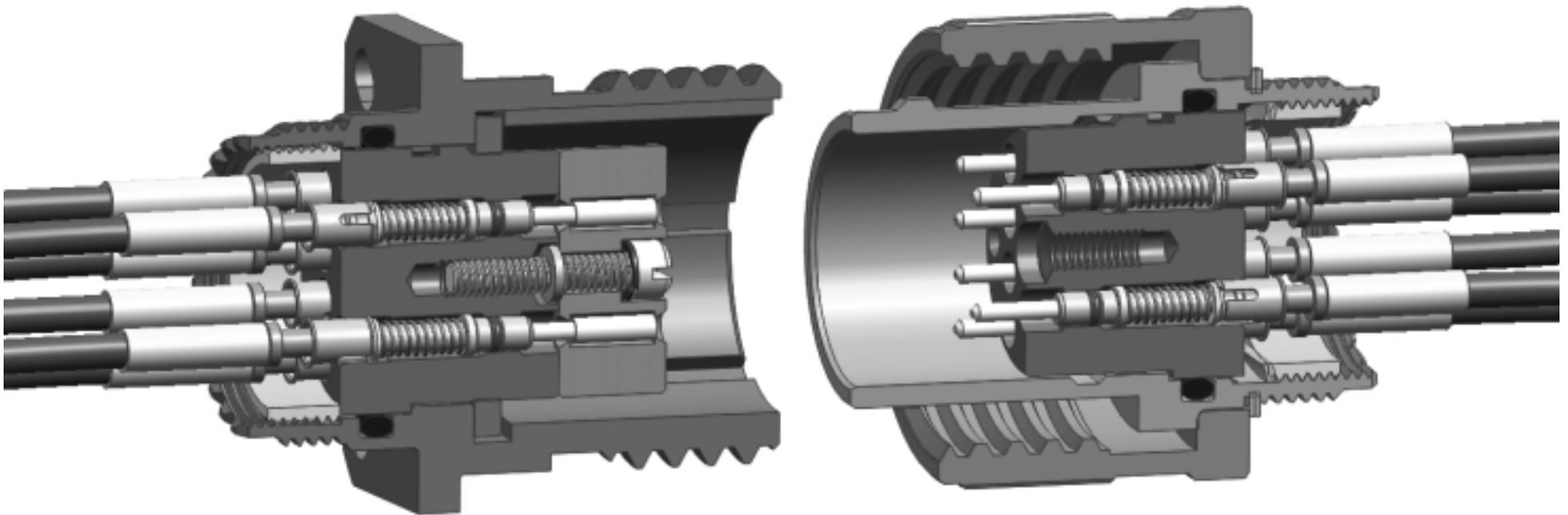
29 JUN 2004

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**DELPHI**

# Next Generation Fiber Optic Connector Development

*Proposed Connector System*



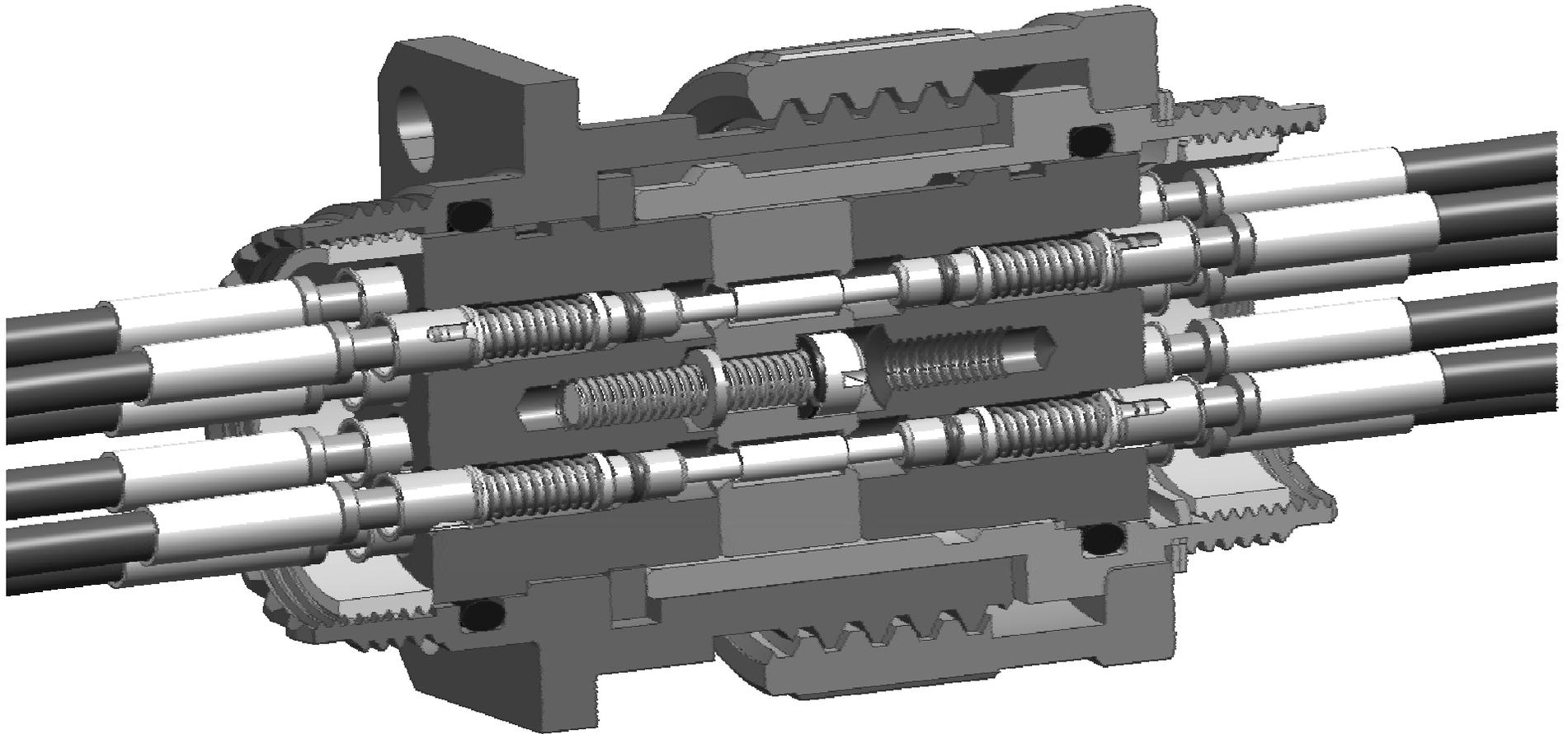
Patent Pending

Connection Systems

**DELPHI**

# Next Generation Fiber Optic Connector Development

*Proposed Connector System*



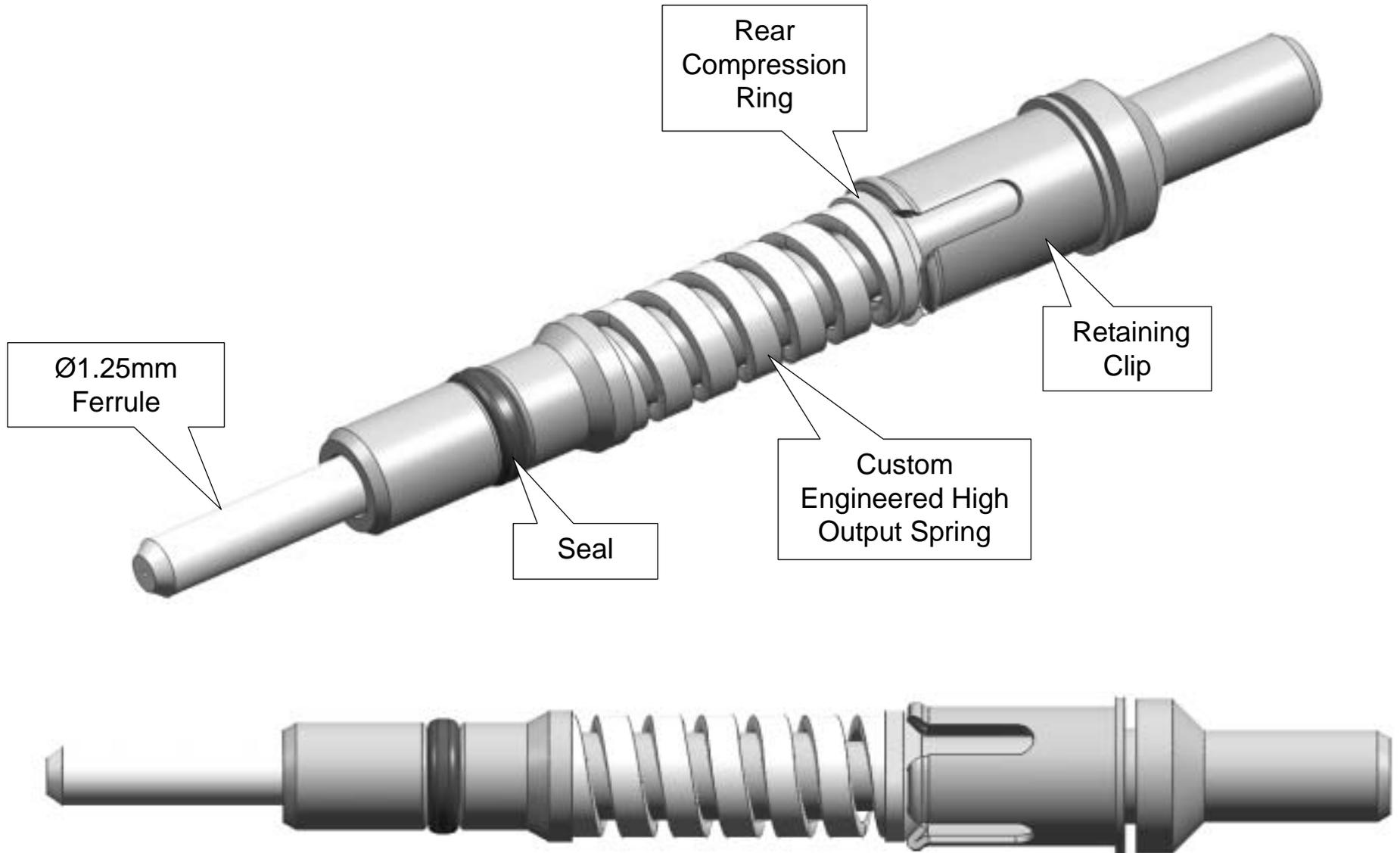
Patent Pending

Connection Systems

### ◆ Features

- Single Fiber Terminus
- Genderless Design
- Ø1.25 mm Ferrule
- Domed PC Polish
- SM / MM Capability in Any Terminus Position
- Rear Insertion, Rear Release
- Spring on Terminus Body
- Seal located on Terminus Body
- 36 Fibers in Shell Size 23
- Tight and Loose Cable Construction Termination
- Crimp Type Strain Relief
- Connector Sizes/Insert Arrangements Must Be as High in Density as Current M28876 Products

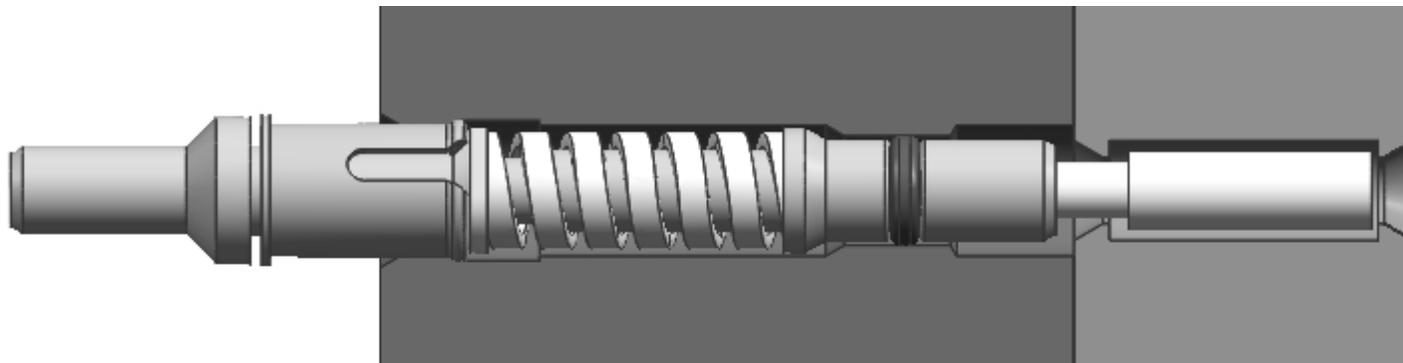
## *Terminus Overview*



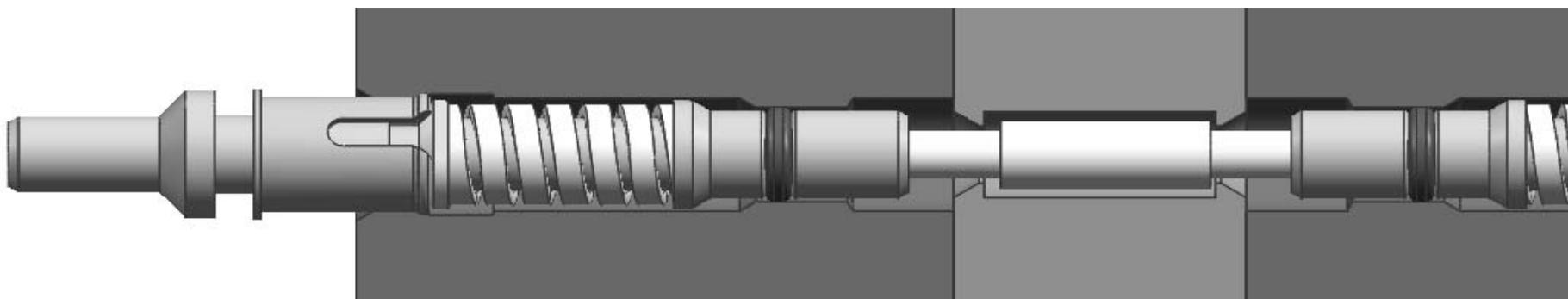
**DELPHI**

# NGCon Fiber Optic Terminus Development

*Modified NGCon Terminus Design*



READY TO MATE



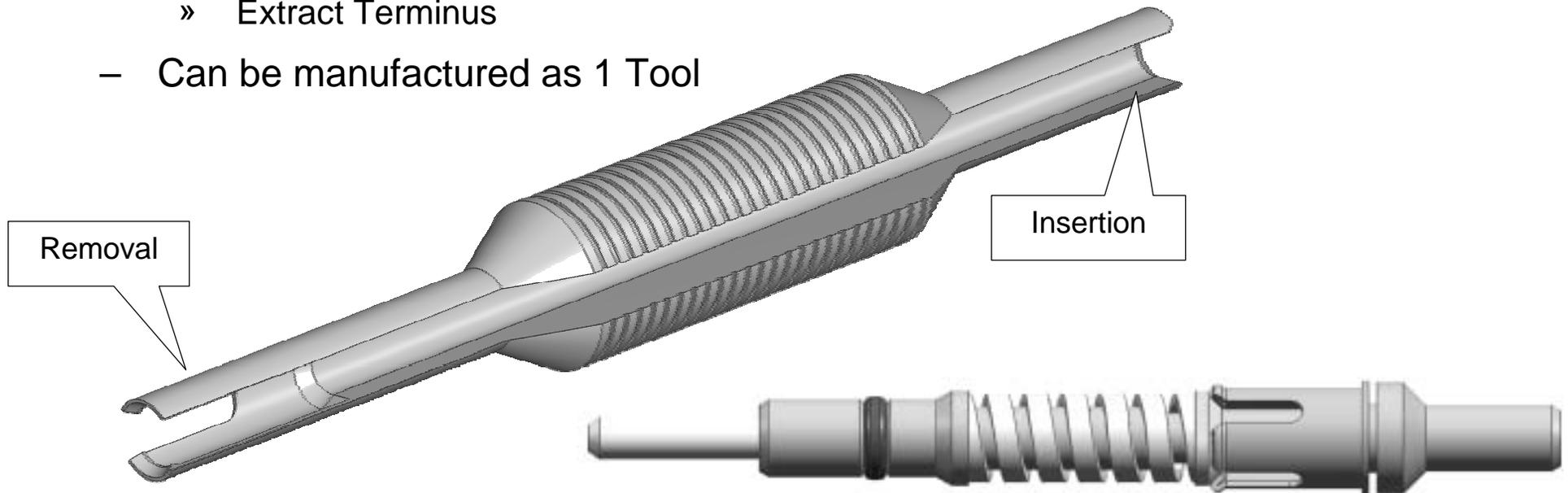
FULL MATE

### ◆ Features

- Uses Rear Release Method of Extracting Terminus with the Following Features:
  - » Individual Cavity Seals are not Affected by Rear Release Tool
  - » Will Allow the Removal of Non-jacketed Buffered Fiber from the Insert without the need for Pulling/Stressing the Fiber
- Upon insertion, the Retaining Clip bottoms on back of insert and resists collapsing until a desired force is achieved
- When Retaining Clip collapses, terminus body is “launched” forward into the cavity until a shoulder on the terminus body bottoms against a shoulder in the cavity

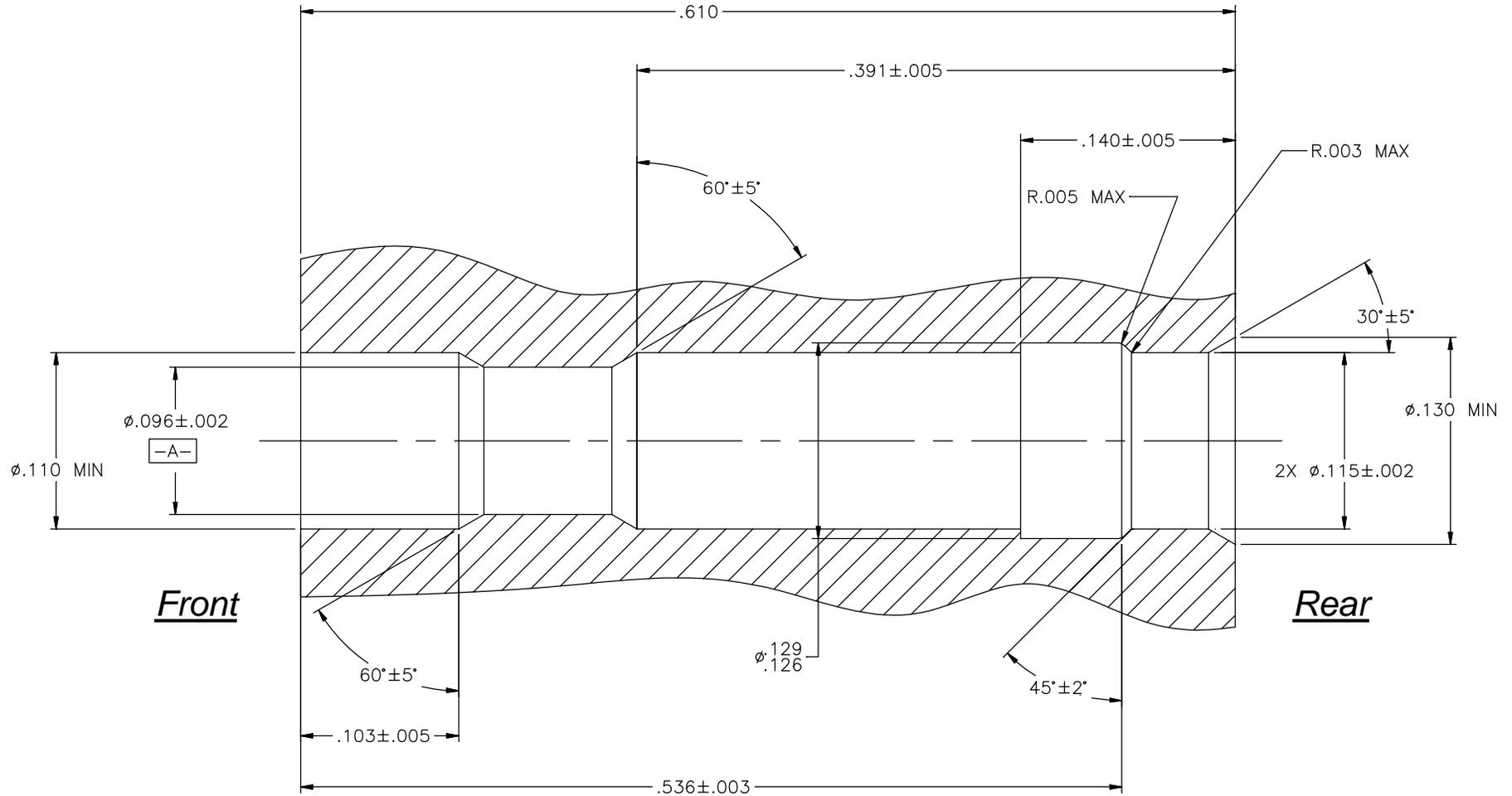
### ◆ Features

- Uses Rear Release Method of Extracting Terminus
  - » Individual Cavity Seals are not Affected by Rear Release Tool
  - » Will Allow the Removal of Non-jacketed Buffered Fiber from the Insert without the need for Pulling/Stressing the Fiber
- Removal is performed with 2 operations
  - » Secure Retaining Clip
  - » Extract Terminus
- Can be manufactured as 1 Tool



# Next Generation Fiber Optic Connector Development

*Standard Cavity (under development)*



2. TERMINUS TO ACCOMMODATE  $\oplus \phi .015 \text{ (S)}$  BETWEEN MATING CAVITIES.

1. MATING CAVITIES TO BE ALIGNED WITHIN  $\oplus \phi .010 \text{ (S)}$

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# **DELPHI**

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***Next Generation  
Heavy Duty Fiber Optic Connector***

**THE TERMINUS SYSTEM**

FEATURES

29 JUN 2004

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## DEFENSE LOGISTICS AGENCY MEETING

Defense Supply Center, Columbus

**KITCO'S Mission Statement:**

**Our mission is to be the leading provider of fiber optic connectorization products, training and services to the military and commercial communications industry. We will do this by exceeding our customers' expectations for service, quality and responsiveness in a way that also benefits our employees, our suppliers and our community.**

**Larry Widgeon's TFOCA Mission Statement:**

**My mission is to design, manufacture, and provide functional comprehensive tool kits that will allow the War Fighter to field repair, inspect, clean, test, & maintain TFOCA & TFOCA II connectors even in harsh and hostile environments. These kits shall include tools for any brand or vendor involved in the industry. In order to complete this mission KITCO must remain unbiased and not be vendor specific. Trust and communication must occur between competitive manufacturers & KITCO, and highly technical information must be shared and kept confidential. I pledge that this will be done in an utmost professional manner including non-disclosure agreements and memorandums of understanding. I insist that the War Fighter's situation be the highest priority. The kits I design will allow for upgrade modules as technology or vendor installation process differences occur and are disclosed.**

**\* "The Right Item, Right Time, Right Price, Every Time... Best Value Solutions for America's War Fighters."**

**\* Quote found at the bottom of DSCC emails.....**



Larry Widgeon

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