Connectivity Solutions for Fiber Optics

Roger Krähenbühl

HUBER+SUHNER: It started with a merger ...

Suhner & Co. AG,
Herisau, AR
founded in 1864

R.+ E. Huber AG,
Pfäffikon, ZH
founded in 1882

the two companies merged in April, 1969

HUBER+SUHNER developed from a company only active in CH into an international group

H+S an international Company

UK

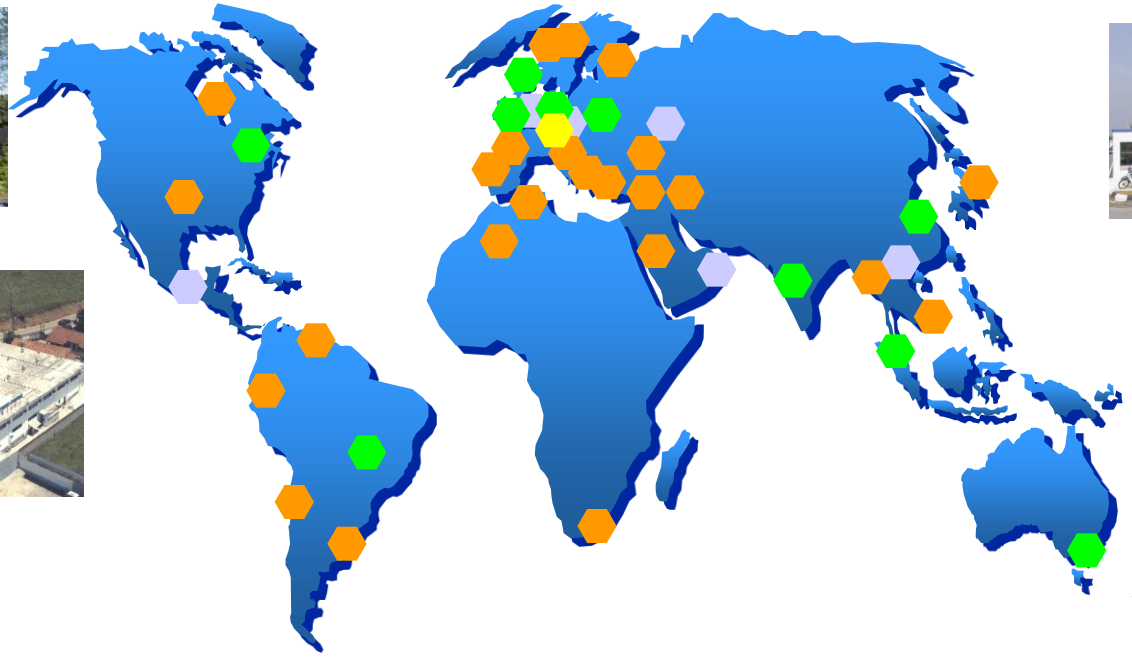

Denmark


Germany


Poland


China


USA




Malaysia


Brasil


Australia

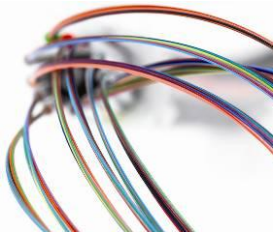
Headquarters

Group company sales / production

Group company sales

Agent

Excellence in Connectivity Solutions: 3 x 3 Strategy

	Communication	Transportation	Industrial
Radio Frequency	 		
Low Frequency including Carbon Fiber Composites	 		
Fiber Optics	 		

With all three Technologies in all three Markets - Worldwide

Fiber Optic: Product Portfolio

Connectors & Assemblies


Standard Connectors


Production Equipment

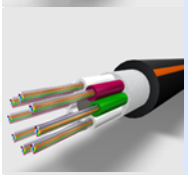

Field Termination

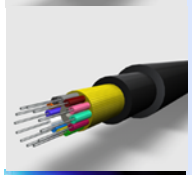

Passive Components


Harsh Environment

Cables


Indoor Cables

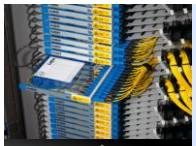

Outdoor Cables


Special Cables


Cabling Systems

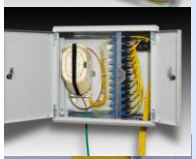

Mobile Cable Systems

Fiber Management


Rack systems Cabinets


LISA splice cassettes


Outdoor Closures


Wall Boxes

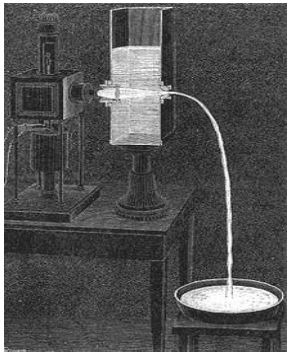

Ducting System


Planning Services

Brief History of Fiber Optics

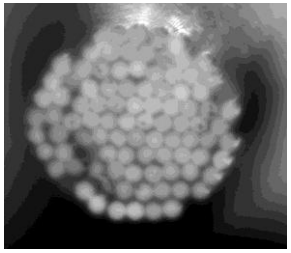
In 1792, France-Claude and Ignace Chappe invented the optical telegraph.

In 1841, Daniel Colladon and Jacques Babinet presented the "Guiding of Light by Refraction" principle, which made fiber optics possible.

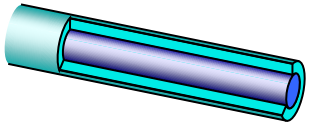


In 1920, J. Baird patented the idea of transmitting images through transparent rods.

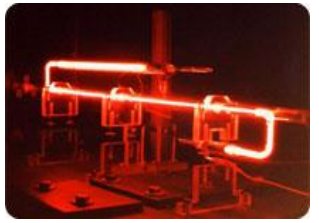
In 1930, H. Lamm transmitted an image of a light bulb filament through a bundle of optical fibers.



In 1951, H. Moeller applied for a patent on fiber-optic imaging proposing cladding glass or plastic fibers with a transparent low-index material



In 1960, the first continuously operating helium-neon gas laser is invented and tested



In 1970, single mode fibers with attenuation less then 20dB/km was reached by scientists at Corning Glass Works.

In 1975, first non-experimental fiber-optic link was installed.

In 1988 the first transatlantic telephone cable went into operation.

Today, the fiber optic industry continues to grow exponentially in terms of both technology and application, and will continue to grow far into the future.

Connector Development in Fiber Optics

Deutsch 1000 (late 70s)
- First commercial successful
- Index matching fluid, lens
- Losses: around 3dB
  (Tektronix OTDR)

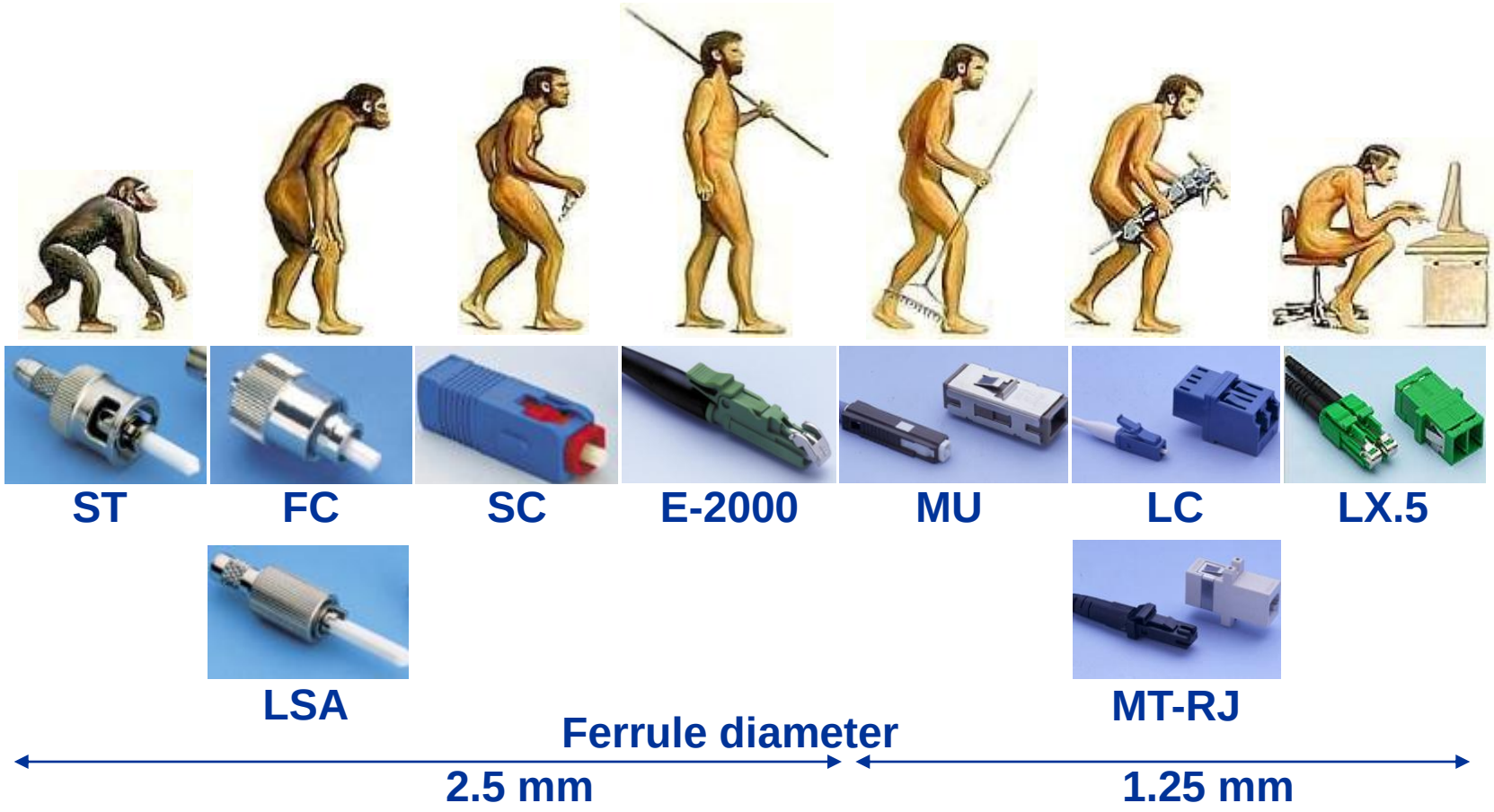
Ceramic Ferrule (mid 80s)
- hard and precise
- fibers accurately located
- physical contact between connectors
- Losses: <0.3dB

BICONIC (mid 80s)
- molded glass filled conic ferrule
- not keyed => air gap
- Losses: 0.5-1dB

SMA (mid 80s)
- 1/8” (3.125m) metal ferrule
- not keyed => air gap
- Losses: 0.5-1dB
  (still in use in some, industrial applications)

In the last 30 years about 100 fiber optic connectors have been introduced to the marketplace, but only a few represent the majority of the market.

Connector Types - Evolution



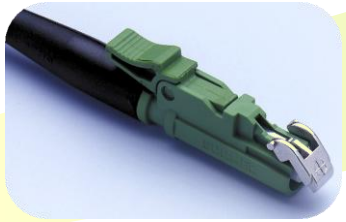
HUBER+SUHNER offers full range of standardized FO connectors

Connector Roadmap: Package Density

Innovation: FiberBus®

Small form-factor multi-fiber connector

LSH



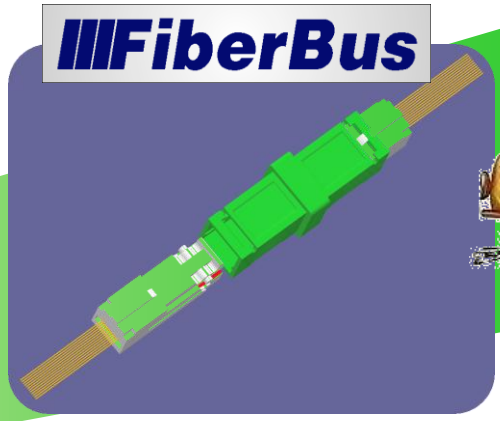
One connection in 13.2 mm

LX.5

Two connections in 13.2 mm

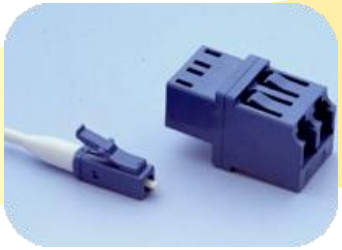
FiberGate

Four connections in 13.2 mm



>12 connections in 13.2 mm

SC



LC

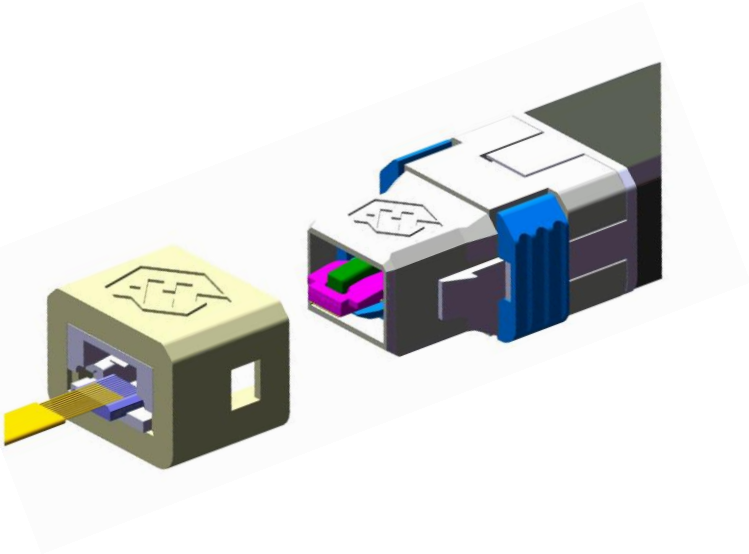
MT

HUBER+SUHNER offers a full range of standardized and customized fiber-optic connectors with high quality.

FO Connector Innovation: FiberBus

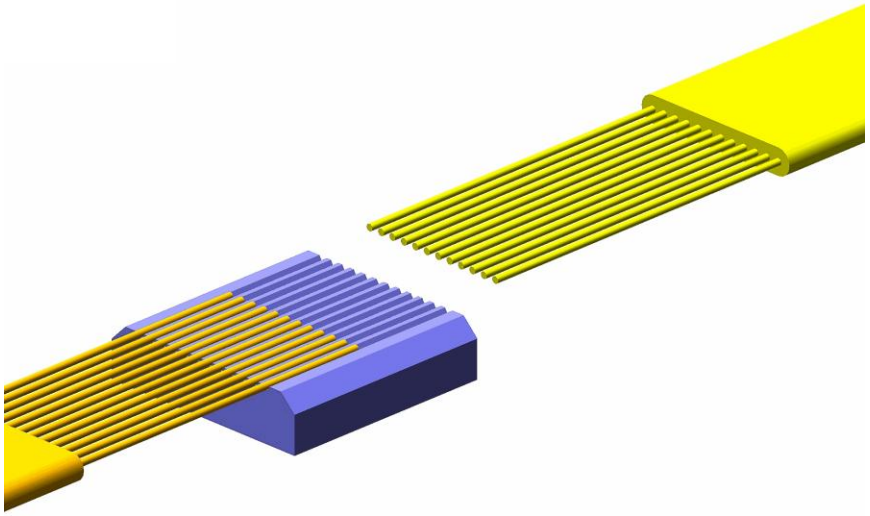
Optical multi-fiber connector as alternative for MT connector with advanced performance for multimode and singlemode

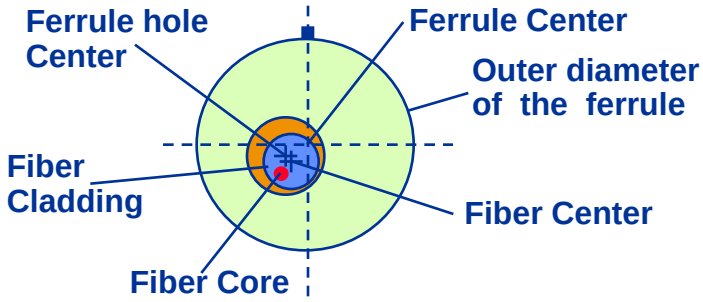
- Up to 12 fibers
- Advanced fiber alignment
- Low insertion loss
- Superior uniformity
- Cost effective
- Dust protection caps

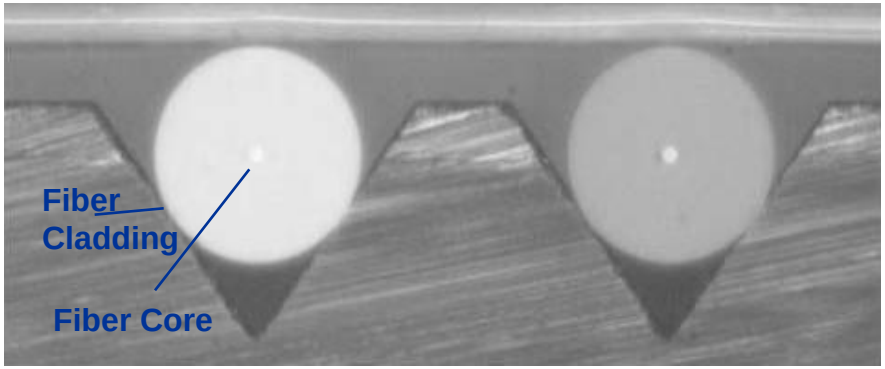


HUBER+SUHNER is committed to technology and innovation leadership.

FiberBus Innovation: Alignment

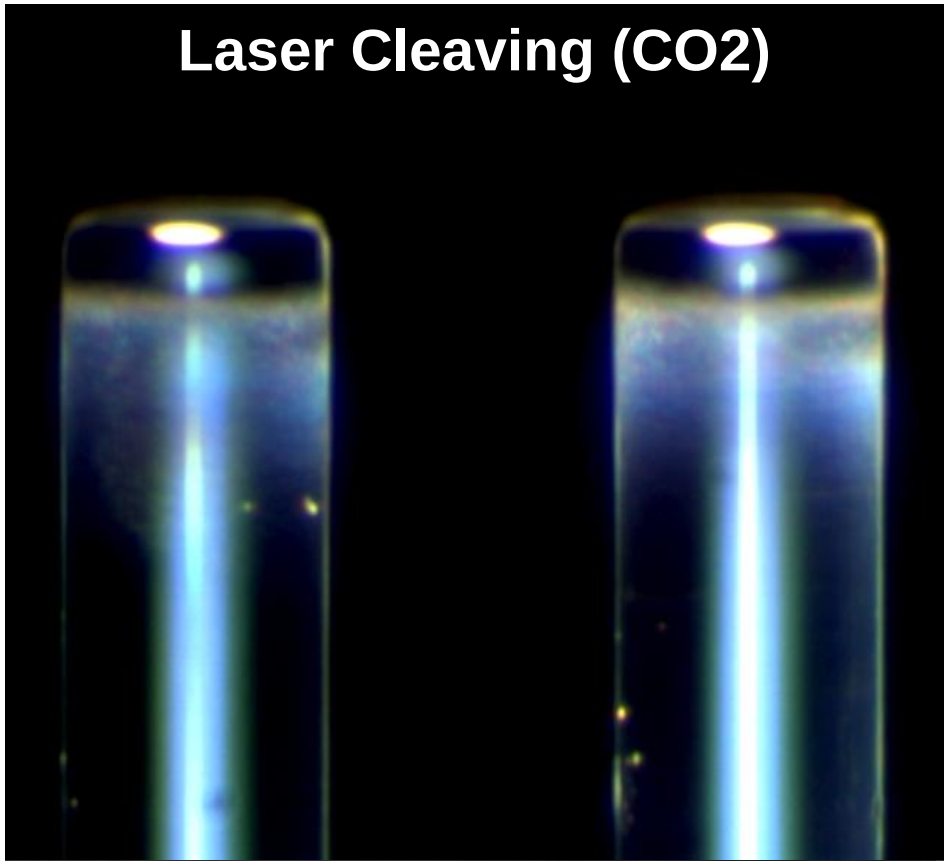






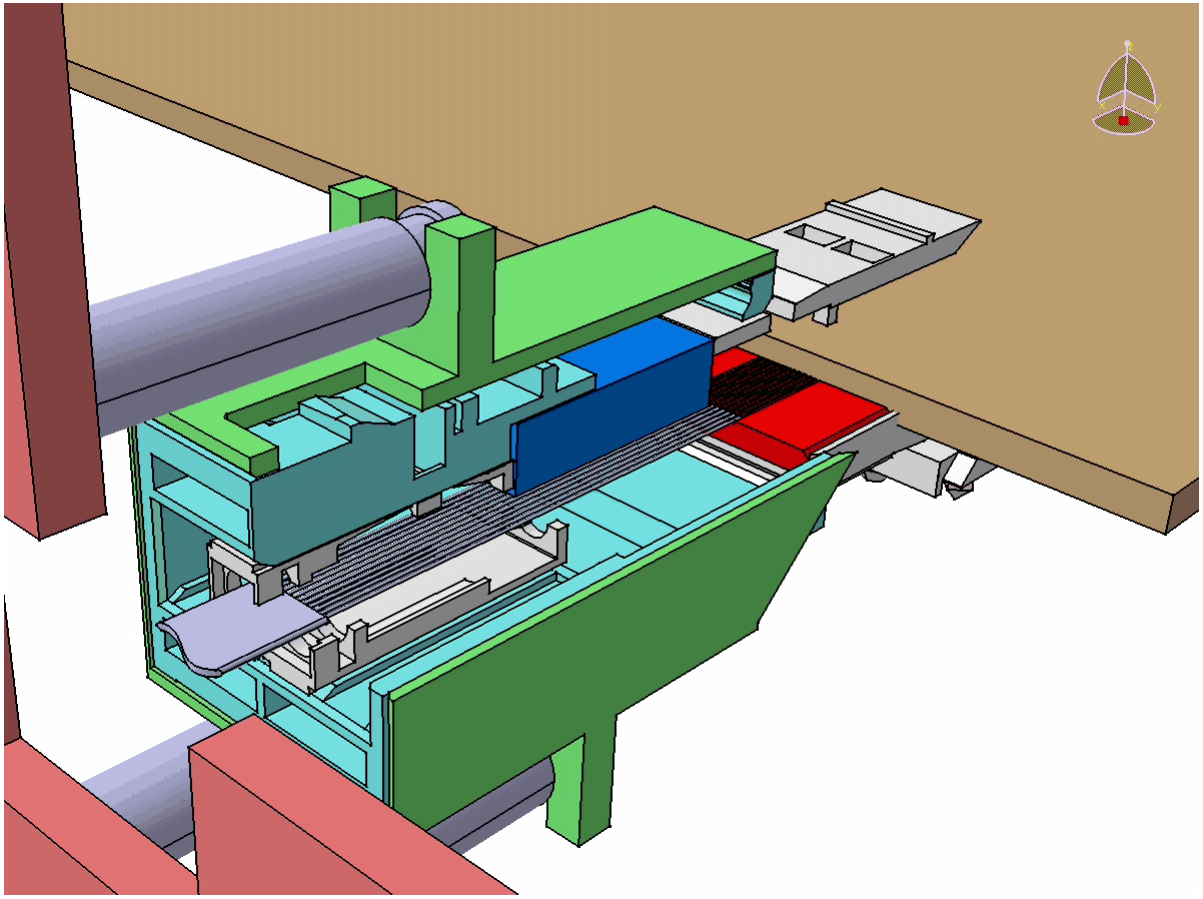
Precise fiber alignment is reached using V-Groove technology, thereby reducing the tolerance chain leading to superior performance.

FiberBus Innovation: Endface Preparation



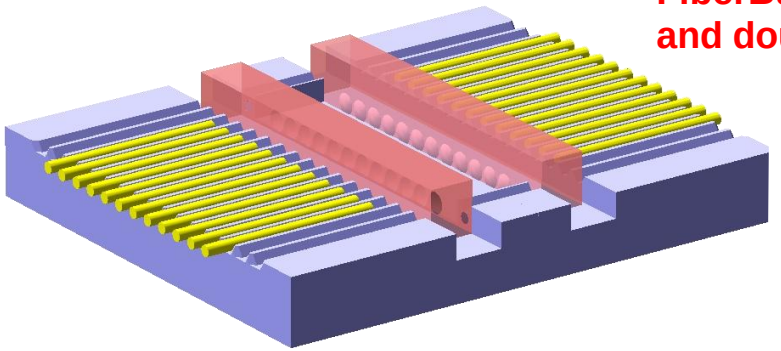
New endface preparation by laser cleaving technology for faster, better and more reliable multi-fiber optical connection.

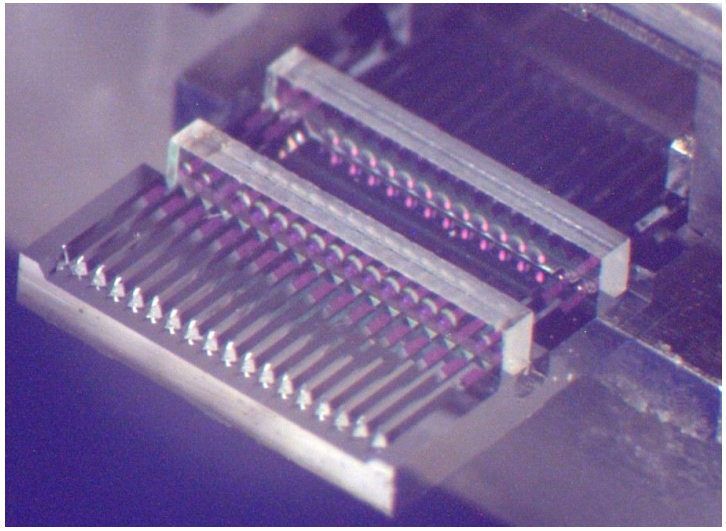
FiberBus Add-On's: Usable as optical Boardconnector

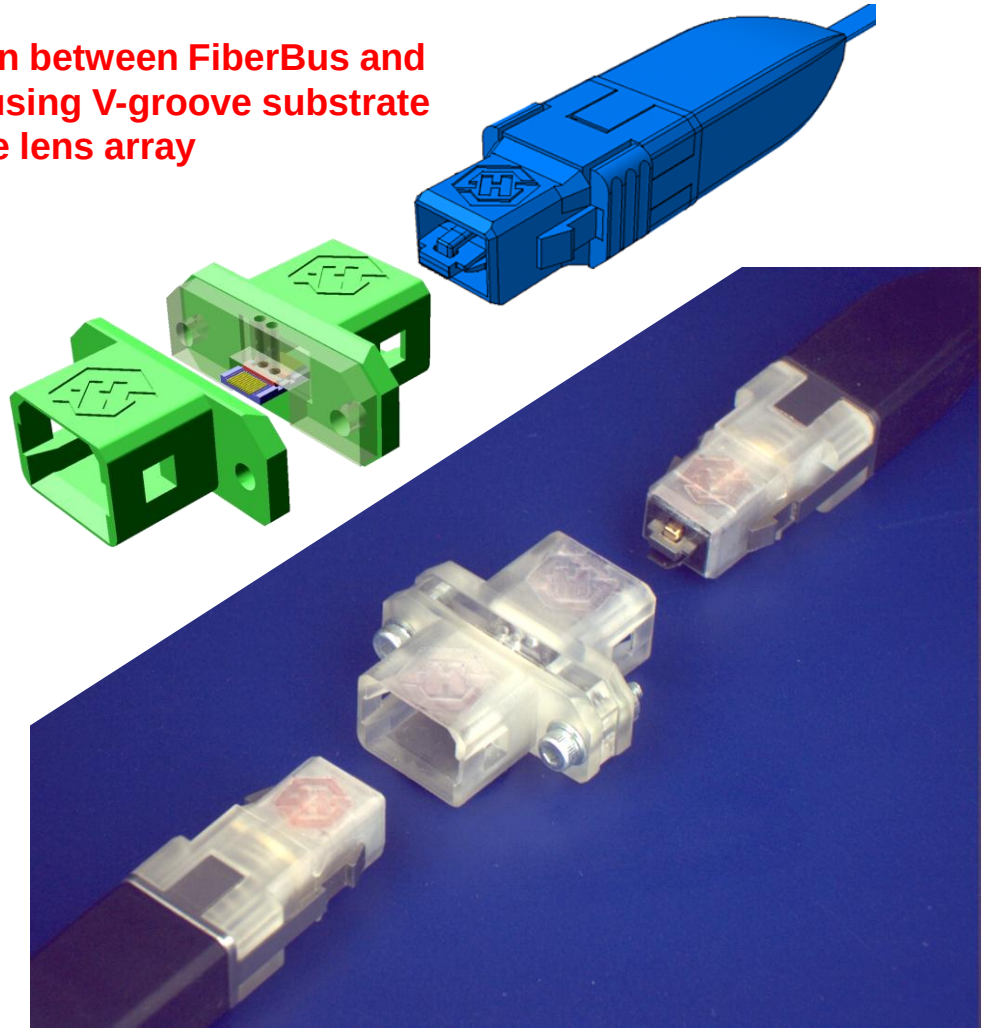


FiberBus Add-On's: Fiber-Lens-Lens-Fiber

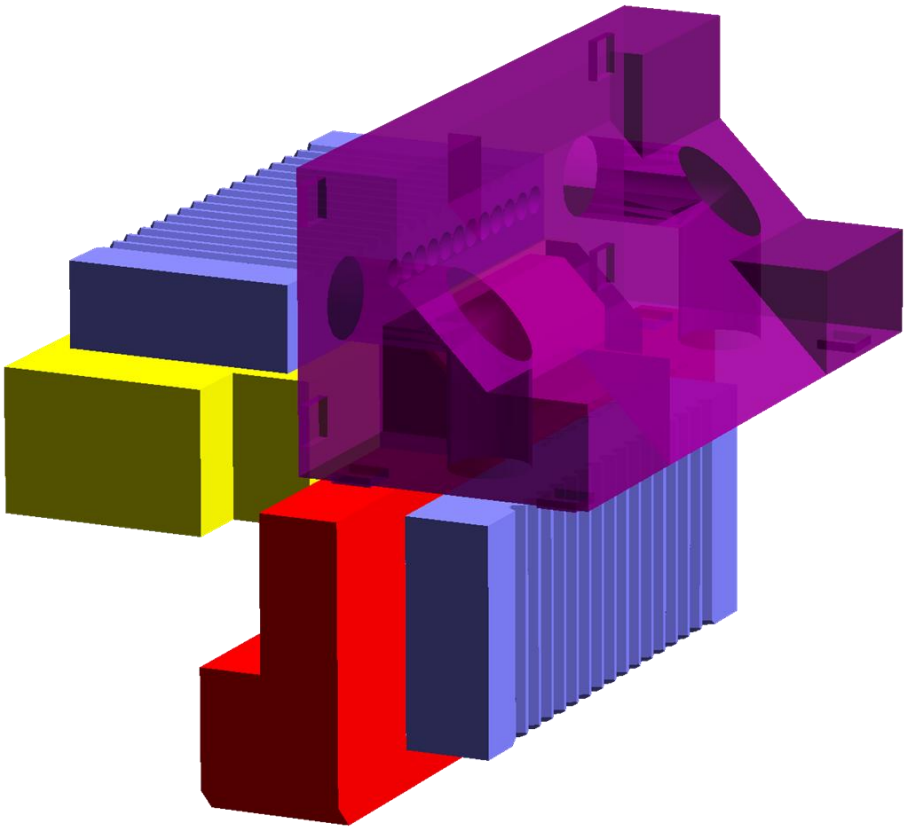
Connectivity solution between FiberBus and FiberBus using V-groove substrate and double lens array

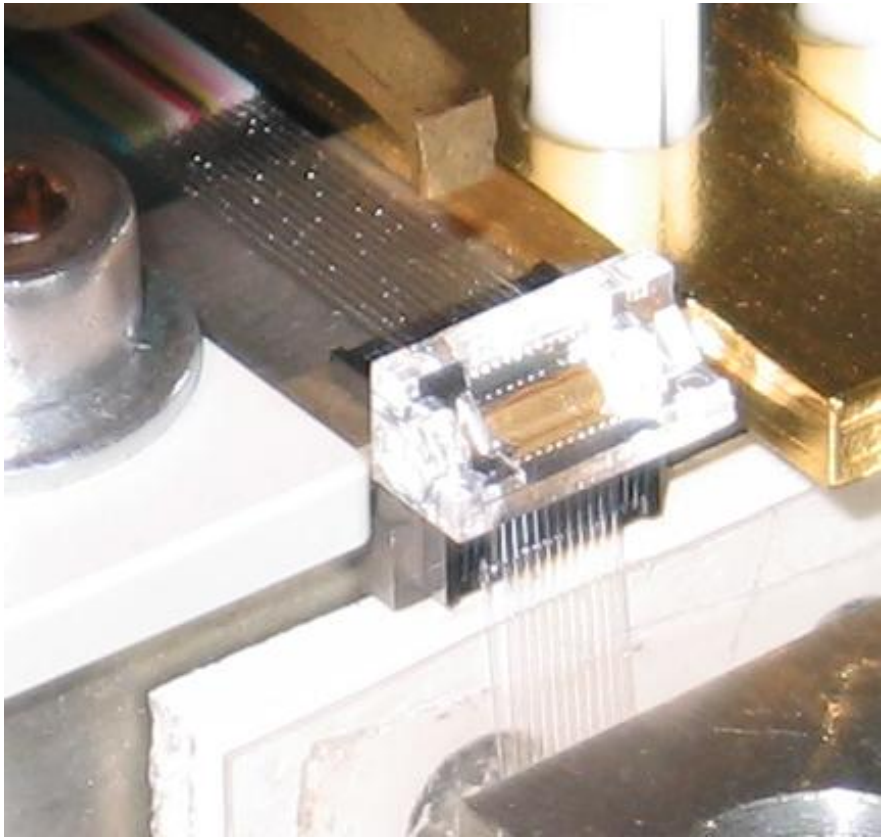






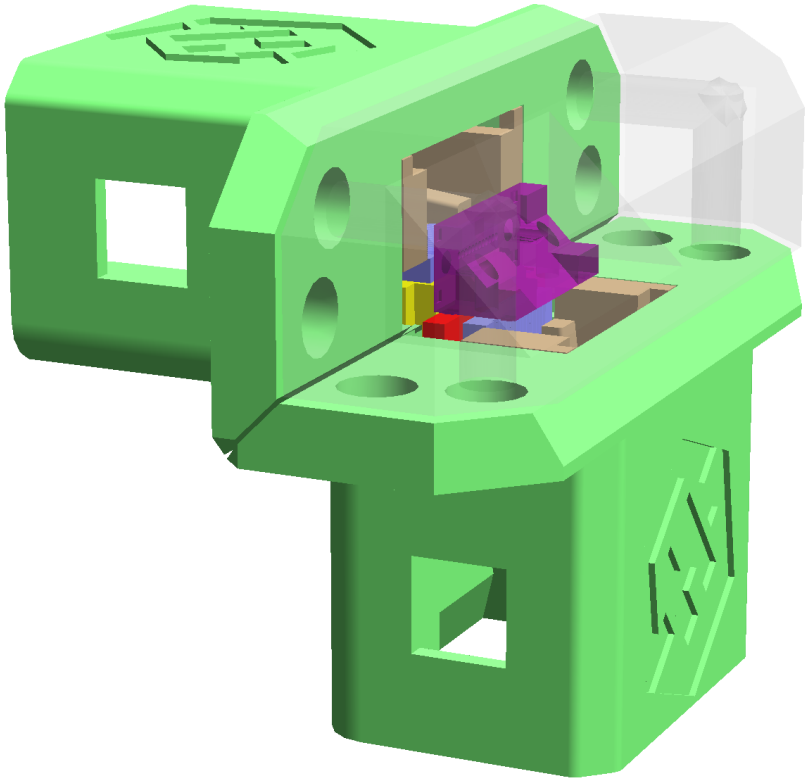
FiberBus Add-On's: 90° Connectivity





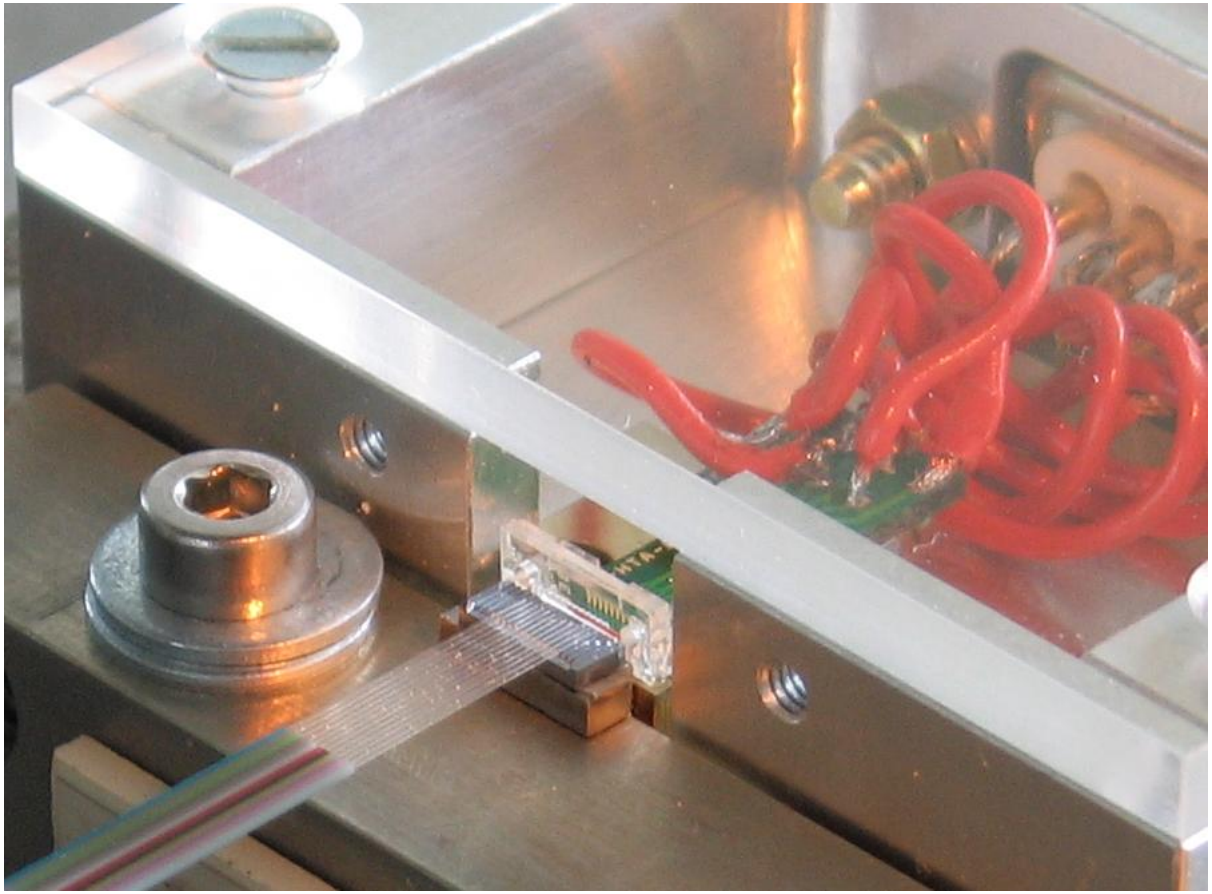
Connectivity solution between FiberBus and FiberBus using subassembly consisting of V-groove substrate and 90° micro-lens array

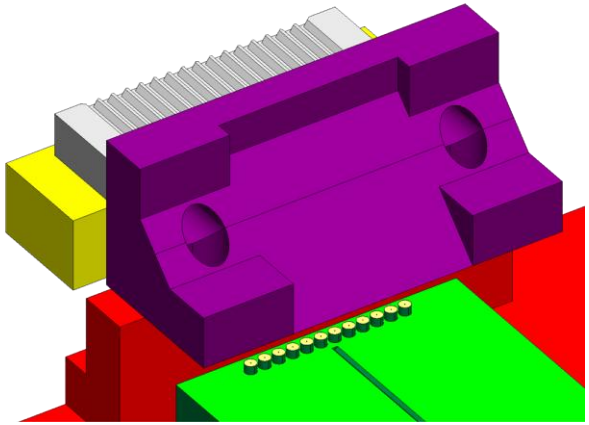
FiberBus Add-On's: 90º Demonstrator

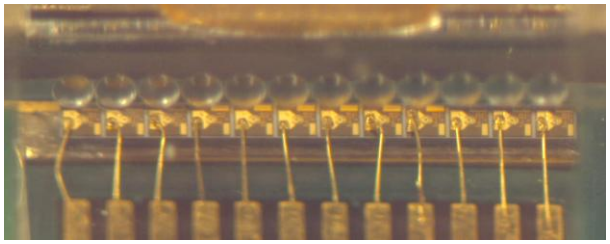


Losses in the range of 1.3 to 2.3 dB at 850 nm were measured (similar to straight solution).

FiberBus Add-On's: Active Connectivity



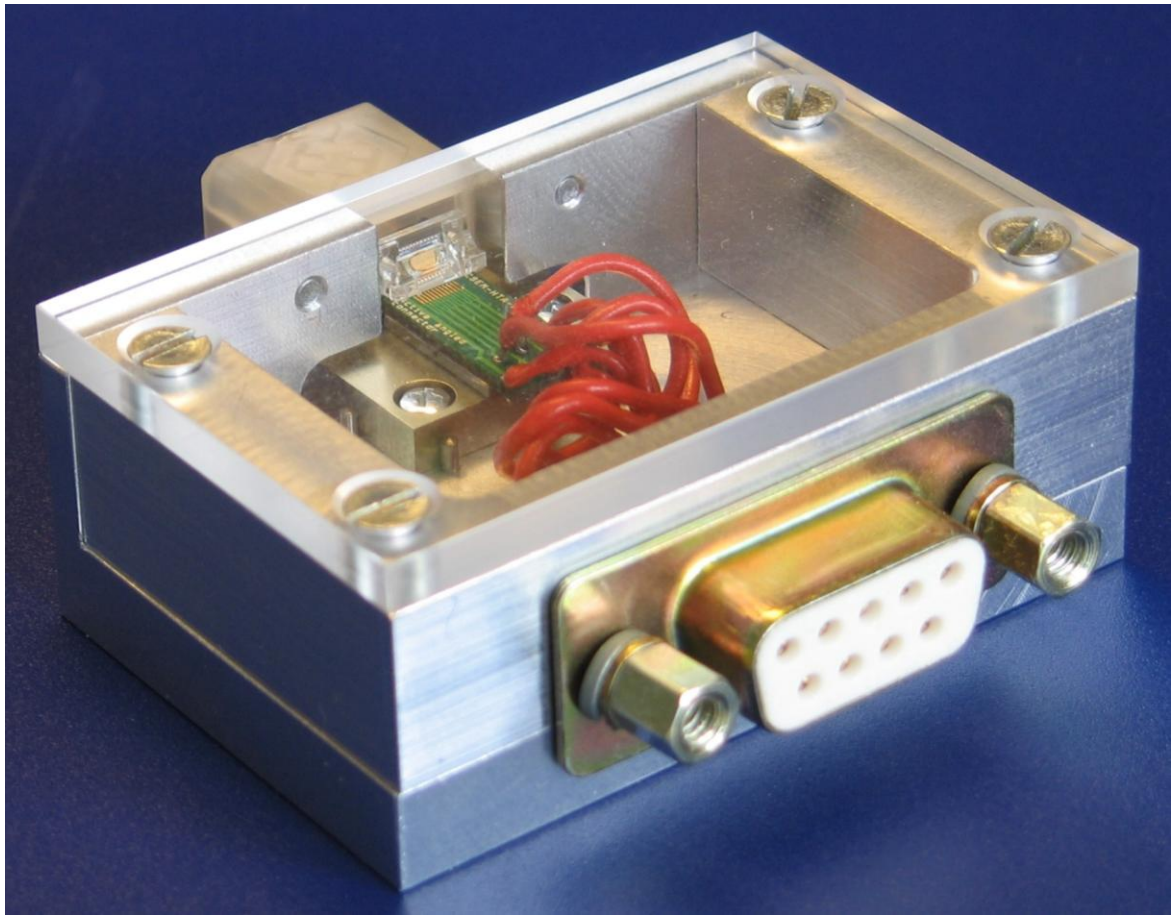




VCSEL array.

Measurement setup to characterize active module using cleaved fiber ribbon.

FiberBus Add-On's: Active Demonstrator

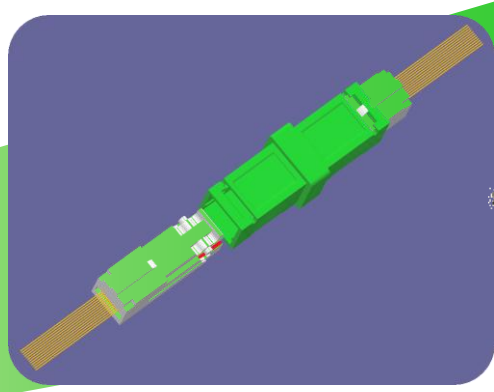


Losses in the range of 3.0 dB at 5 mA were measured (very similar to bare fiber measurement).

FO Connector Innovation: Driven by Market

Innovation: not only driven by technology but also by the market

FiberGate



>12 connection in 13.2 mm

LX.5

Two connection in 13.2 mm

LSH

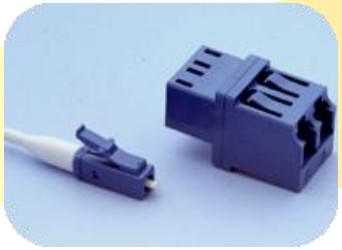
One connection in 13.2 mm

Four connection in 13.2 mm

ODC

MT

SC



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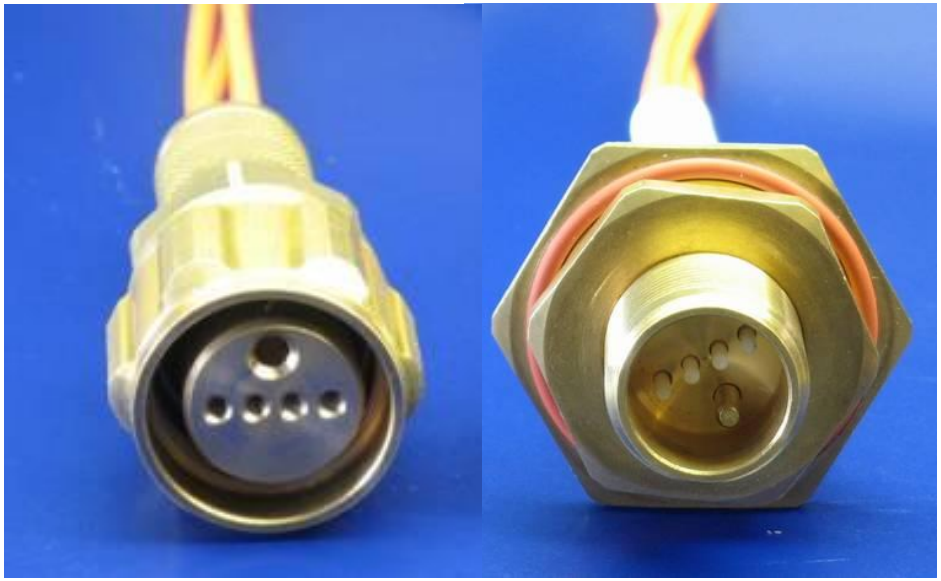
HUBER+SUHNER offers the right product at the right time

FO Connector Innovation: ODC

ODC (Optical Outdoor Connector) for fiber-to-the-antenna application



HUBER+SUHNER is committed to flexibility and time to market leadership.

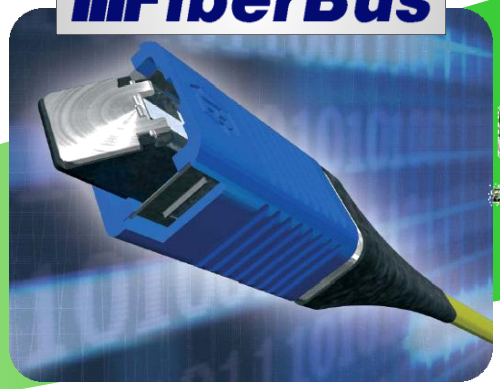
FO Connector Innovation: Driven by Market

Innovation: not only driven by technology but also by the market

FiberGate

Four connection in 13.2 mm

FiberBus



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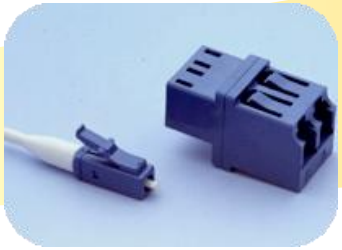

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Thank you for your attention.