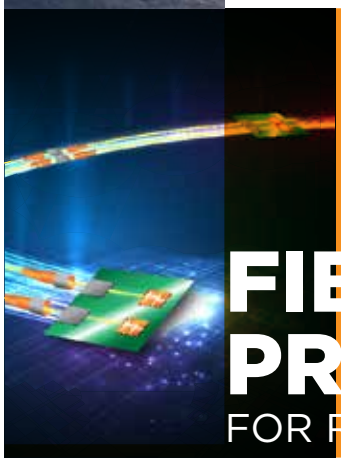


FIBER OPTIC PRODUCTS

FOR RUGGED APPLICATIONS

Rugged End-to-End Solutions for More Bandwidth, More Distance, More Performance

iS Rayfast

FIBER OPTIC PRODUCTS

Rugged End-to-End Solutions for Challenging Applications

Trusted Solutions

TE Connectivity's (TE) ruggedized fiber optics brings the benefits of optical technology to the challenging environments of defense and aerospace applications.

Higher Speeds over Longer Transmission Distances. Ethernet and other fast communications protocols—with the capacity to handle next-generation 40G and 100G when you are ready—without the severe distance limitations of copper cable.

EMI Immunity. Because it is a dielectric, an optical fiber neither radiates nor receives electrical noise. The bulky shielding of copper cables is unnecessary.

Small Size, Light Weight. Optical cables offer significant size and weight savings to help meet SWaP goals.

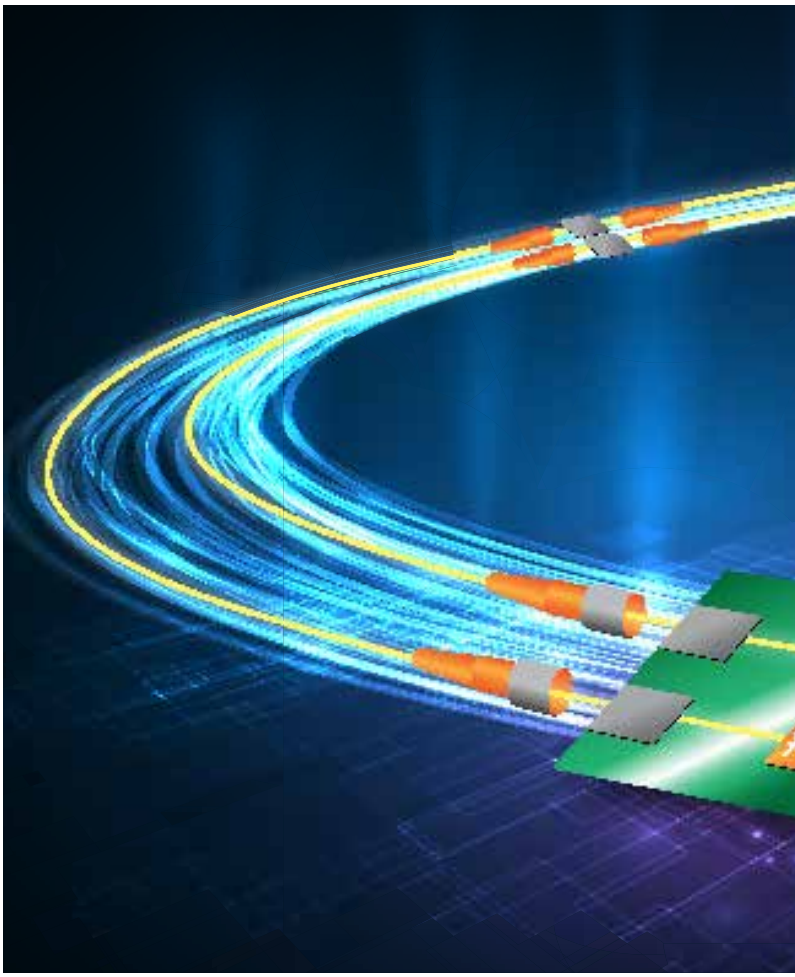
As the need for higher bandwidth, speed and capacity continues to expand, TE's ruggedized products are helping empower applications such as:

- Commercial, General and Military Avionics
- C4ISR Electronic Systems
- Air, Ground, and Marine Defense Systems
- Missile Defense
- Offshore and Subsea Systems
- Commercial Marine
- Space

End-to-End Connectivity Solutions

We offer comprehensive end-to-end solutions to help you deploy optical systems from ASIC to ASIC.

- Connectors
- Cable
- Optical Flex Circuitry
- Bypass Switches
- Active Devices



Built to Survive

As a trusted leader in optical technology, TE offers connector solutions that are also easy to maintain in the field. Our products are designed to operate reliably in harsh and challenging environments, and the company's technical specialists have an in-depth understanding of application requirements.

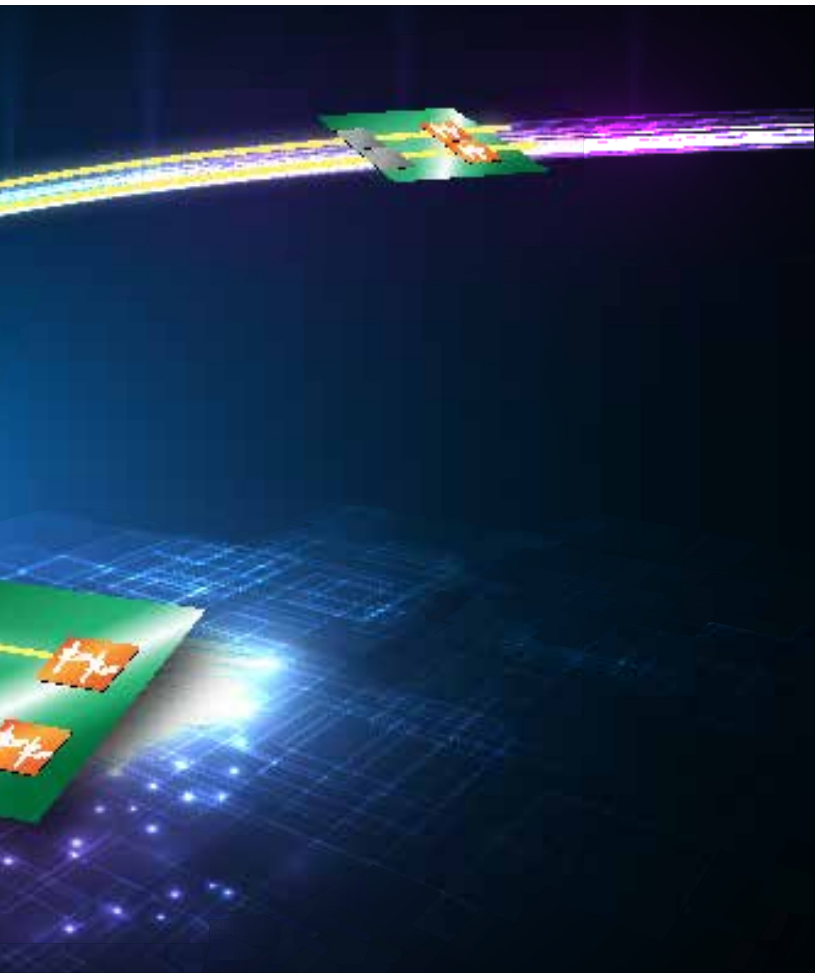
Ease of Use

- Rear-removable optical contacts
- Removable alignment sleeve that helps support simple, effective cleaning and maintenance

TE Components . . . TE Technology . . . TE Know-how . . .

AMP | Agastat | CII | Hartman | Kilovac | Microdot | Nanonics | Polamco | Raychem | Rochester | DEUTSCH
SEACON Phoenix | L.L. Rowe | Phoenix Optix | SEACON

Get your product to market faster with a smarter, better solution.



Precision Connections

- Dowel pin alignment
- Standard and tight-tolerance keying

Ruggedness

- Environmental sealing
- Anti-vibration coupling mechanisms
- Pressure-balanced subsea connectors

Wide Range

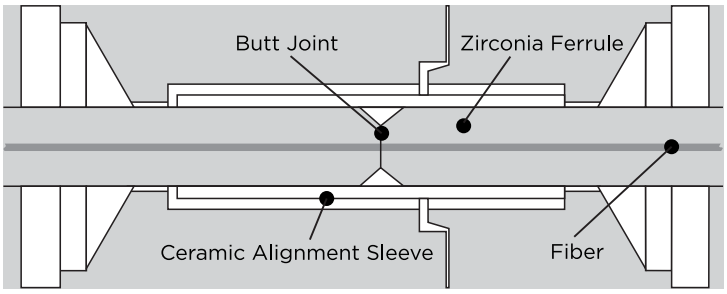
- PC and EB interface styles
- Versions for land, sea, and air

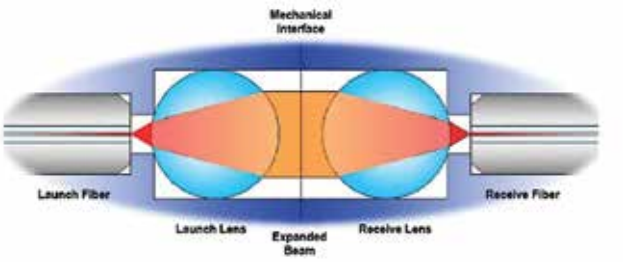
Physical Contact (PC) Connectors

A PC connection uses ferrules that are mated within a precision sleeve to assure radial alignment to minimize optical misalignment losses. The termini and mating sleeves can be incorporated into standard circular and rectangular connectors to provide multichannel operation. PC connections offer:

- Lowest insertion loss
- Lower reflection
- Compact format

While most PC connectors use a ceramic ferrule for a single fiber, the MT ferrule is a multifiber variation typically holding 12 or 24 fibers.





Expanded Beam (EB) Connectors

EB connectors expand and re-focus light at the fiber end faces and allow an air gap in the optical pathway. The EB concept uses optical lenses (typically a 3-mm ball lens for dedicated inserts or 1.25 lens for EB16 termini) to expand and collimate the beam emitted from the launch fiber. The expanded beam remains collimated across the mechanical interface until the receiving lens focuses the beam onto the receiving fiber.

Channel counts for EB-specific connectors are 1, 2, 4 and 8. Since these connectors are used in rugged environments they are usually terminated on robust fiber cables as well as in the tactical applications with rugged optical cable, metal tubed or avionics/flight-grade cable.

The absence of physical fiber contact makes EB connectors very useful in demanding environments. They offer

- Sealed optical interface
- High vibration and shock resistance
- High mating-cycle durability
- Tolerance to dirt and debris
- Easy cleaning

COMPARISON OF PC AND EB CONNECTOR TECHNOLOGIES

Performance Criteria	PC	EB
Insertion Loss	★★★★	★★
Return Loss (SM)	★★★★	★★
Return Loss (SM) – Unmated	★	★★
Lateral Connector Misalignment	★	★★★★
Connector Angular Tilt	★★★★	★
Mating Durability	★★	★★★★
Water Exposure	★★★	★★

Performance Criteria	PC	EB
Dust Exposure	★	★★★
Vibration Susceptibility	★★	★★★
Repair	★★	★★
Cleanability	★★	★★★★
Wear	★	★★★★
Wavelength Range	★★★★	★★

OVERVIEW OF TE FIBER OPTIC CONNECTORS

Family	Shell Materials	Termini Styles	Shell Sizes	No. of Fibers	Insertion Loss, Typ. (dB)	Notes
MIL-DTL-38999 QPL and 38999-Style Connectors						
MC801	Aluminum, Composite	ARINC 801	—	—	0.3	
MC5	Composite	DEUTSCH 1.25 mm	11-25	1, 2, 4, 6, 8, 10, 18, 30	0.3	
MC4	Aluminum	2.5 mm	9	2	0.4	
MC3	Aluminum	DEUTSCH 2.5 mm	19, 23, 25	5, 8, 12	0.5	
Expanded Beam 38999 III Style	Aluminum	Inserts	11, 15	1, 2, 4, 8	0.7	Insert Lens assembly
Expanded Beam	Aluminum, Composite	Size 16 EB	11-25	Up to 36	<1.0	MIL-PRF-29504 style, but with a lens
D38999 Series III QPL	Aluminum, Composite	M29504	11-25	Up to 36	0.75	
Special Purpose, 38999 Type						
RSC	ARCAP CRES	DEUTSCH 2.5 mm EB16	—	1	0.5	Single channel 38999 style, PC, APC, tunable, and EB versions
MC6	Composite	MT	11	12, 24	0.5	
Rectangular Connectors						
EN4165	Aluminum Composite	ARINC 801 DEUTSCH 1.25 mm MT		2 801 + 5 size 16 and 2 size 22 contacts 6 12, 24	0.3 0.3 0.5	
369 Series	Composite	MT	—	12, 24	0.5	
ARINC	Aluminum	ARINC 801 Mini EB		12, 36 (ARINC 801) 4,16, 24 (EB) in size 2 shell inserts	0.3 0.7	
GPR	Aluminum	ARINC 801 Mini EB		1 – 12 (ARINC 801) 4, 8 (EB)	0.3 0.7	
Field Deployable Expanded Beam Connectors						
M83526/20 and /21	Aluminum	EB		2 and 4 SM and MM	0.7	Hermaphroditic coupling
PRO BEAM Series	Aluminum	EB		1, 2, 4 or 8 SM and MM	0.7	Three sizes: Sr., Jr. and Mini
Board-Level Connectors						
VITA 66	Stainless Steel	MT ARINC 801 EB		12, 24 4 4	0.5 0.3 0.7	
Discrete Connectors for Equipment Hook-Up and Restoration						
Type	**Styles**					
Tight Construction	LC, SC	For tight-buffered cable epoxy applied			0.3	
LightCrimp PLUS	LC, SC, ST, Splice	No epoxy, no polish			0.5	

PHYSICAL CONTACT TERMINI

ARINC 801 Termini
- Industry-standard 1.25 mm ceramic ferrule
- MIL-DTL-38999 and ARINC connectors

MIL-PRF-29504/4 Pin and /5 Socket Termini
- Size 16 ceramic termini designed for use in 38999 circular connectors
- Spring-loaded socket helps maintain consistent contact between mated ferrules

DEUTSCH MC5 1.25-mm Termini
- 1.25-mm ceramic ferrule for high contact densities
- Designed specifically for use in the MC5 connector

DEUTSCH MC3 2.5-mm Termini
- 2.5-mm ceramic ferrules
- For use in a variety of DEUTSCH connectors

EXPANDED BEAM TERMINI

EB Lens Insert Assemblies
- Inserts for military and ARINC connectors
- Fully sealed interface designs

HDLT Termini Assemblies
- Ultra-high density
- 12, 24, or 36 fibers in a size 8 cavity
- Lens protection for each fiber
- Available as factory-terminated cables assemblies

PRO BEAM EB16 Termini

Compact Size 16
- Fit standard size 16 cavity
- Drop-in replacement for M29504/4 and /5 physical contact termini

MULTICHANNEL CONNECTORS

DEUTSCH MC801 Connectors

Rugged
- Resists shock and vibration, moisture, and corrosion
- 100% scoop proof
- Self-locking threaded coupling for anti-vibration integrity

Lightweight
- High-strength aluminum shells
- 38999 Series III style
- ARINC 801 termini

DEUTSCH D38999 Series III QPL Connectors

Rugged
- Resists shock and vibration, moisture, and corrosion
- 100% scoop proof
- Self-locking threaded coupling for anti-vibration integrity

Lightweight
- High-strength aluminum shells
- MIL-PRF-29504 style termini

HDLT Connectors

High-Density Lensed Termini
- Uses standard Quadrax contact geometry and shell inserts
- 12, 24, or 36 fibers in a size 8 cavity
- Lens protection for each fiber
- Up to 8 termini or 288 fibers per connector
- TE ribbonized discrete cable for full degrees of freedom
- Flexibility for easier routing

DEUTSCH MC3 MKII Connectors

Harsh Environments
- High-performance, maintainable optical connectivity
- Insert-to-insert keying assists precision alignment

Convenient
- Individually rear insertable/ removable optical contacts enable easy assembly
- Backshells and adapters available for most single and multifiber cable types

DEUTSCH MC4 Connectors

High Density
- Compact 1.25 mm precision zirconia ceramic ferrules
- Extensive range including 1, 2, 4, 6, 8, 10, and 30 positions

Robust
- Sustained performance over a wide range of environmental conditions
- Simple termination process and tooling

DEUTSCH MC5 Connectors

High Density
- Compact 1.25 mm precision zirconia ceramic ferrules
- Extensive range including 1, 2, 4, 6, 8, 10, and 30 positions

Robust
- Sustained performance over a wide range of environmental conditions
- Simple termination process and tooling

DEUTSCH MC6 Connectors

High Density
- MT ferrules for 12 and 24 channels

Convenient
- Rear release contact using size 8 extraction tools
- Retrofit triple rear seal available
- MIL-DTL-38999 Series III anti-vibration coupling with tri-start thread

DEUTSCH RSC Connectors

Rugged
- Single-channel connectors
- Manufactured from Arcap alloy for corrosion resistance
- Anti-vibration coupling mechanism

Versatile
- RSC:
- RSC EB: Accepts EB16 and M29504/4 and /5 termini
- RSC-v: APC or tunable interface

MULTICHANNEL CONNECTORS

M83526/20, /21 and PRO BEAM Connectors

Expanded Beam Interface
- Performs consistently and reliably
- 3000-mating-cycle durability
- Vibration tolerant

Flexible
- 1, 2, 4 or 8 fibers in a single connector interface
- Available in Sr., Jr. and Mini sizes

GPR Connectors

Versatile
- Shell accepts inserts for signal, power, coax, data bus, and fiber optic contacts
- GPRB version for fiber optics
- F12 insert for up to 12 ARINC 801 termini
- M2 insert holds two 4-channel mini-EB inserts

DEUTSCH DMC-M Connectors

Flexible
- Multi-insert configurations
- MC5, MT, and ARINC 801 interfaces
- Hybrid electrical/ ARINC 801 inserts

Lightweight
- Composite housing

ARINC Connectors

Flexible
- Inserts for ARINC 404 and 600 connectors
- Up to 4 Mini EB termini per insert or 128 per connector
- Up to 36 standard 1.25 mm MC5 termini per insert

Convenient
- Easily removable front insert allows cleaning or replacing damaged alignment sleeves

DEUTSCH EN4165 Connectors

Flexible
- Interchangeable modular inserts
- MC5, MT, and ARINC 801 interfaces
- ARINC 801/electrical hybrid

Easy to Use
- Easy-to-use insertion/ extraction tool
- Easy access to optical contacts for cleaning and maintenance

DEUTSCH 369 Connectors

Compact
- 24-fiber MT ferrule
- Single mode or multimode ribbon or discrete fibers
- Integrated plug-side coupling bushing

Versatile
- In-line or flange mount

DRY-MATE CONNECTORS

DEUTSCH 9316 Series Connectors

Rugged
- Withstands high mechanical stress
- Explosion-proof for use in hazardous areas and polluted environments

Versatile
- Two shell sizes for 3 or 12 contacts
- Optical and hybrid versions available
- Custom backshell designs available

DEUTSCH Showet Series Splash-Zone Connectors

Hybrid Design
- Copper and fiber in a single shell
- Supports signal and control needs
- 4 multimode optical and 4 copper contacts

DRY-MATE CONNECTORS

DEUTSCH MOD Series Splash-Zone Connectors

Safe
- Quick connect/disconnect in hazardous areas
- Explosion-proof
- Up to 8 fibers
- Rated to 580 psi

SEACON MSS Series Connectors

Flexible Hybrid Design
- 6 shell sizes, with a variety of inserts
- Up to 48 optical and 44 size 8 electrical contacts
- Rated to 20,000 psi

SEACON OPTI-CON Connectors

Versatile
- 5 shell sizes in stainless steel or titanium
- Up to 20 optical or electrical contacts in any combination
- Rated up to 5200 m and 7500 psi

SEACON GRE Connectors

- Glass reinforce epoxy
- Rated to 20,000 psi
- Bulkhead version for penetrator applications

WET-MATE CONNECTORS

DEUTSCH DO3000 Series Connectors

Optimized for Subsea Distribution Systems
- Up to 12 fibers
- ROV, bulkhead, stab plate, and diver versions
- Operational seawater depths to 4500 meters
- Rated at 6600 psi

DEUTSCH O-1DH Series Connectors

High-Pressure, High-Temperature Downhole Applications
- Fit into in-well tight casings
- Optical connectivity from in-well measurement systems
- Rated to 15,000 psi
- 350°F working temperature

DEUTSCH OFS Series Connectors

Rugged Reliability
- Connects permanently installed downhole sensors/ instrumentation and a data acquisition system
- Provides pressure barrier between wellbore and the subsea environment
- Rated at up to 22,500 psi

SEACON HYDRALIGHT Connectors

Versatile
- 6 to 48 optical channels
- 100 mating cycle durability
- Qualified to 7000 m and up to 10,000 psi
- Hybrid version with power rated to 1000 VAC

WET-MATE CONNECTORS

SEACON G3 Connectors

Compact Low Profile
- Suitable for stab, diver and ROV operations
- 6 optical channels
- Rated to 15,000 psi

SEACON Microstar Connectors

Slimline Design
- 4 optical channels in <1.8" diameter

High-Integrity
- Qualified for 7000 m and up to 10,000 psi
- 25-mating-cycle durability

BOARD-LEVEL PRODUCTS

VITA 66 Optical Modules

Industry Standard
- Compatible with VITA 46 VPX systems

Versatile
- MT: extreme density with up to 48 fibers/module
- ARINC 801: excellent single-mode performance
- Expanded beam: noncontacting interface for frequent mating cycles

Optical Flex Circuits

Versatile
- Symmetrical and asymmetrical designs
- Very low insertion loss over a broad temperature range
- Range of packaging options for environmental conditions

Electro-Optic Packaging

Rugged
- Sealed board-to-board interface
- High reliability
- Meets or exceeds VITA specs for shock and vibration
- Mezzanine-style mating to the pc board

DISCRETE CONNECTORS

LightCrimp Plus Connectors

Fast, Easy Field Termination
- No epoxy, no polish
- Simple strip, cleave and crimp process

High Performance
- Factory-polished ferrule for consistent, high-quality finish

Standard Interfaces
- SC, ST and LC styles
- Tight-jacketed epoxy connectors also available

Sealed LC Connectors

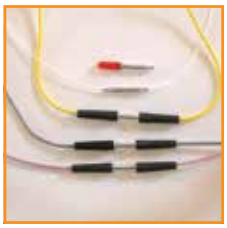
Robust
- ODVA style
- IP 67 sealing
- Aluminum or composite shells

DISCRETE CONNECTORS

U.S Navy Commercial Item Description Approved

NAVSEA Approved

- Approved for shipboard use
- LightCrimp Plus ST multimode connectors
- Tight construction single-mode and multimode SC and LC connectors



Mechanical Optical Splice

High Performance

- NAVSEA approved for shipboard use
- Manufactured to single-mode tolerances
- Capable of jacketed and buffered fiber
- High-reliability optical terminations

CABLES AND CABLE ASSEMBLIES

Rochester Armored Fiber Optic Cable

Rugged Tactical, Field Deployable

- 2 and 4 fiber constructions with color-coded fibers
- Stainless-steel, gel-filled rodent-resistant tube
- Steel-wire strength members
- Hybrid copper/fiber options available

Phoenix Optix Cassettes and Adapter Panels

Full Range

- LC, SC, and MPO interfaces
- Standard and high-density versions
- Support for single-mode and multimode applications

Phoenix Optix Cable Assemblies and Harnesses

Convenient

- Complete assemblies, tested and ready to go
- Optical performance exceeds industry standards
- Widest range of configurations, trunk and patch cables, and fiber types

ACCESSORIES

Tactical Optical Cable Repair Kit

Convenient

- Fusion splice for repairing up to four fibers at once
- Cable repair protection sleeves
- Solutions for rodent-resistant cables and standard tactical cable

Reels

Heavy-Duty, Lightweight

- Cable reel to organize and protect connectors
- Up to 500 meters

Flexible

- Options include special backpack harnesses, separate reel stand or combo reel/reel stand

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iS Rayfast

TE connectivity