



Industrial & Harsh Environment (HE)





Typical applications:

1. Antenna
7. Oil/Gas

2. Avionics/Space
8. Container terminal

3. Mining
9. MIL/Defense

4. Solar plant
10. Transportation

5. Industry

6. Wind farm

Features needed for HE solutions

HE products must be able to withstand:

- Adverse temperatures and weather conditions
- Shocks, Vibrations, tensile stress
- External pressure, corrosive surroundings, etc.





DM4 based HE products

HE-2000™, MIL-38999 DM4 Family, MIL-83526DM4



DM4 (Multipurpose Termini)

- Based on 2.5-mm Fusion Alberinos with integrated springs to prevent termini separation
- Up to 4 channels
- Hybrid, FO – Electrical contacts
- Genderless mating and self-aligning design
- Easy front-face ferrule access for cleaning & inspection
- Easy termini insertion and removal for field termination and repair



DM4 (hybrid)



DM4



2.5mm Crocodile
Fusion Alberino HE

DM Termini

DM Termini features of optical & electrical termini

- Compatible with several fiber types such as HCS, MM, SM, PM, Power Solution and small-core fibers
- Available in PC and APC versions
- Steady and repeatable low IL and high return loss
- High and steady ER when terminated with PM fibers
- Compatible with tight cable construction and semi-loose cable/fiber construction
- Field repair and termination available with the Diamond *Fusion Crocodile Alberino* and ***Diamond ZEUS D50 HE fusion splicer***
- Titanium ferrule front face
- Electrical pin: 20 AWG



Optical and electrical specifications of the DM4



OPTICAL PERFORMANCES (obtained with the diamond proposed cables)

| MEASUREMENT/TEST | MULTIMODE | SINGLE MODE PC/APC | STANDARDS |
|---------------------------------|---------------------------|-------------------------------|--|
| Insertion loss (std. version) | typ. 0.20 dB max. 0.50 dB | typ. 0.15 dB max. 0.45 dB | IEC 61300-3-4 ($\lambda = 1310 / 1550$ nm) |
| Insertion loss (fusion version) | typ. 0.20 dB max. 0.50 dB | typ. 0.25 dB max. 0.45 dB | IEC 61300-3-4 ($\lambda = 1310 / 1550$ nm) |
| Insertion loss (PM) version) | - | typ. 0.25 dB max. 0.45 dB | IEC 61300-3-4 ($\lambda = 1310 / 1550$ nm) |
| Return loss | min. 40 dB | min. 75 dB (APC) min. 50 (PC) | IEC 61300-3-6 ($\lambda = 1550$ nm) |
| Extinction Ratio | - | typ. 23 dB min. 20 dB | Diamond validated cross polarizers method ($\lambda = 1550$ nm) |

ELECTRICAL TESTS

| | | |
|---------------------------|----------------------------|--|
| Insulation resistant test | Resistance >200 M Ω | IEC 60512-3-1: 2002 (500V / 60 s) |
| Voltage Proof test | PASS | IEC 60512-4-1: 2003 (2500V / 60 s / 50 Hz) |



DM4 (Multipurpose Termini)

The DM4 is the core of our **HE-2000™**,
MIL-38999 DM4 Family and **MIL-83526
DM4 connectors**

DM4



HE -2000™



**MIL-38999
DM4 Family**



**MIL-83526
DM4**



HE-2000 features

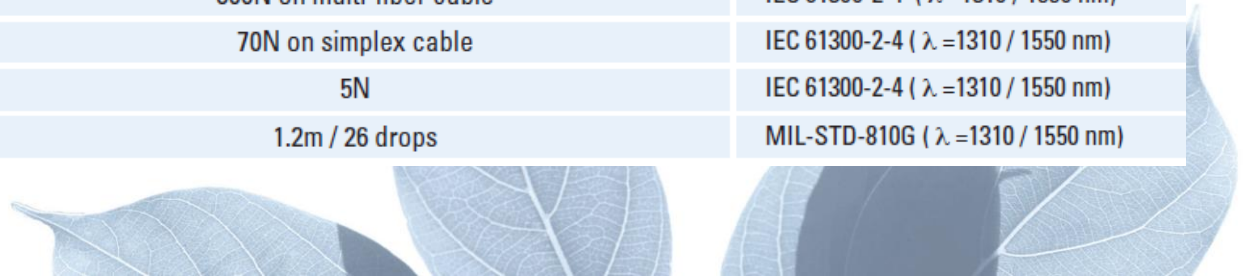


- Automatic protection shutter on connector IP 65
- Bulkhead IP 67 (manual shutter) or IP 54 (automatic shutter)
- Harsh-environment plastic shell, made from nylon with 25% fiber-glass reinforcement
- Easy front-face ferrule access for cleaning & inspection
- Push-pull mechanism for easy handling



Mechanical specifications

| | | |
|-----------------------------------|---------------------------|---|
| Change of temperature | -55 / + 85 °C | IEC 61300-2-22 (λ =1310 / 1550 nm) |
| Low temperature | -55 °C (96h) | MIL-STD-810G (λ =1310 / 1550 nm) |
| High temperature | +85 °C (96h) | MIL-STD-810G (λ =1310 / 1550 nm) |
| Humidity | 95% r.h. / 10 cycles | MIL-STD-810G (λ =1310 / 1550 nm) |
| Temperature shock | -55 / + 85 °C | MIL-STD-810G (λ =1310 / 1550 nm) |
| Low pressure / altitude | 110 mbar /15240 m | MIL-STD-810G (λ =1310 / 1550 nm) |
| Vibration | 10/2000 Hz (3h) | MIL-STD-202G (λ =1310 / 1550 nm) |
| Mating durability | 500 cycles | IEC 61300-2-2 (λ =1310 / 1550 nm) |
| Cable torsion | +/-180° / 25 cycles | IEC 61300-2-5 (λ =1310 / 1550 nm) |
| Flexing of strain relief | +/-90° / 25 cycles | IEC 61300-2-44 (λ =1310 / 1550 nm) |
| Static side load | 2N/90° (5min.) | IEC 61300-2-42 (λ =1310 / 1550 nm) |
| Cable retention on connector side | 800N on multi-fiber cable | IEC 61300-2-4 (λ =1310 / 1550 nm) |
| Cable retention on bulkhead side | 70N on simplex cable | IEC 61300-2-4 (λ =1310 / 1550 nm) |
| Fibre retention | 5N | IEC 61300-2-4 (λ =1310 / 1550 nm) |
| Shock | 1.2m / 26 drops | MIL-STD-810G (λ =1310 / 1550 nm) |



MIL-38999 DM4 Size 13

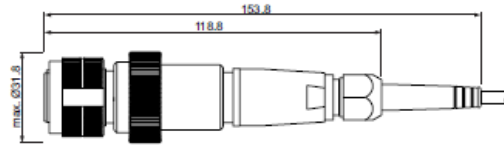
- All features of the DM4
- Compatible with tight cable construction, semi loose cable/fibre construction
- IP 67 rated enclosures (Connector and bulkhead)
- Easy front-face ferrule access for cleaning & inspection



MIL-38999 DM4 Size 13 configurations connectors



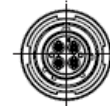
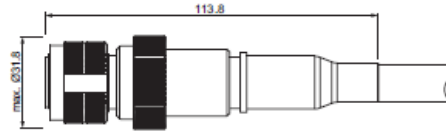
Type C13/1 Connector with mini-break cable (5mm or 5.5mm)



DM4 Adapter



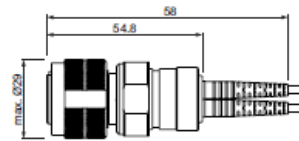
Type C13/2 Connector with protection tube for fiber 900um max.



DM4 Adapter



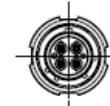
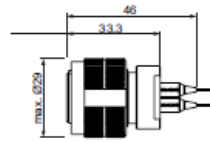
Type C13/3 Connector for simplex cable version (1.6 - 2mm, 2.5 - 3mm) with IP protection



DM4 Adapter



Type C13/4 Connector for simplex cable (1.6-3mm) or fiber 900um max. without IP protection

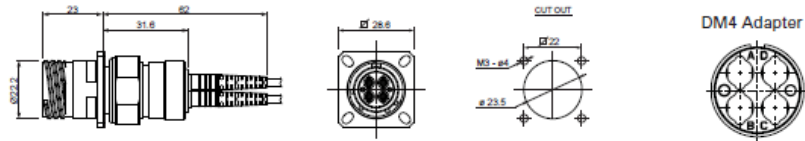


DM4 Adapter

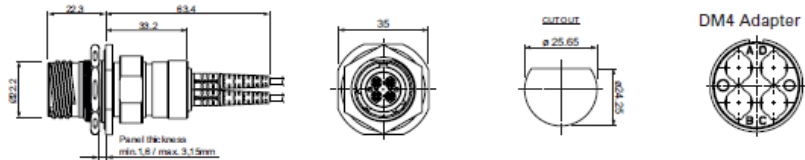


MIL-38999 DM4 Size 13 configurations bulkhead

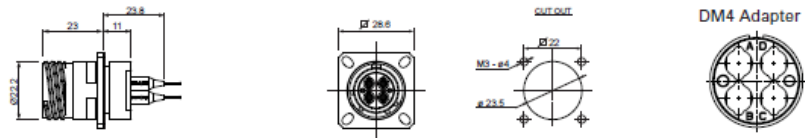
Type B13/1S Bulkhead for simplex cable (1.6 - 2mm, 2.5 - 3mm) with IP protection



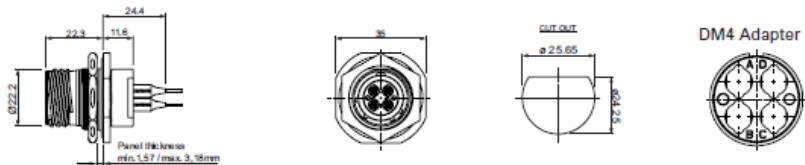
Type B13/1R Bulkhead for simplex cable (1.6 - 2mm, 2.5 - 3mm) with IP protection



Type B13/2S Bulkhead for simplex cable (1.6 - 3mm) or fiber 900um max. without IP protection



Type B13/2R Bulkhead for simplex cable (1.6 - 3mm) or fiber 900um max. without IP protection



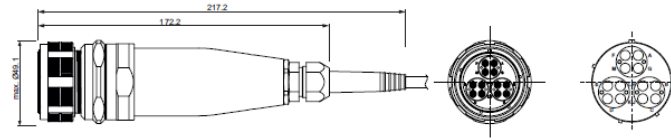
MIL-38999 DM4 Size 25

- All features of the DM4 (3 x DM4) 12 channel
- Compatible with tight cable construction, semi loose cable/fibre construction
- IP 67 rated enclosures (Connector and bulkhead)
- Easy front-face ferrule access for cleaning & inspection

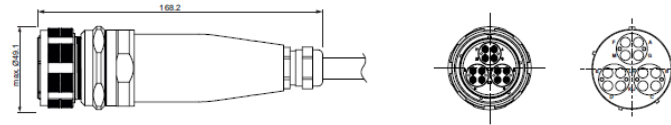


MIL-38999 DM4 Size 25 configurations

Type C25/1 Connector with mini-break cable (6mm - 8.8mm)



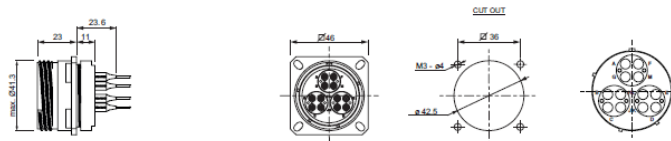
Type C25/2 Connector with protection tube for fiber 900um max.



Type C25/3 Connector for simplex cable version (1.6 - 3mm) or fiber 900um max. without IP protection



Type B25/1S Bulkhead for simplex cable (1.6 - 3mm) or fiber 900um max. without IP protection



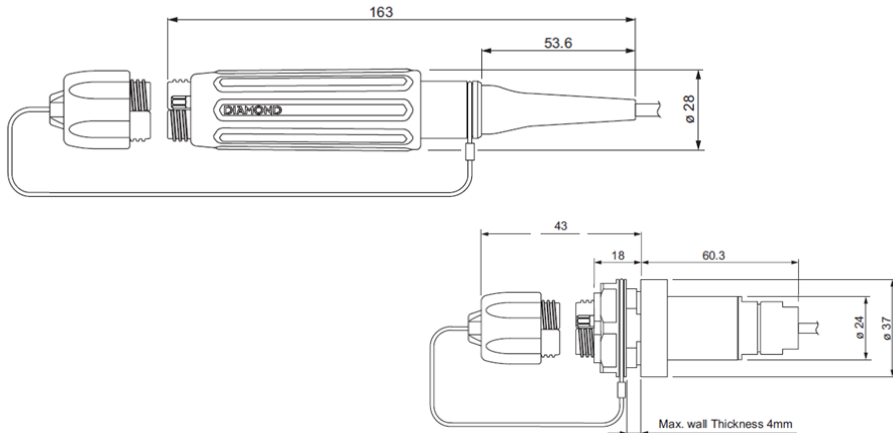
Mechanical specifications for MIL-38999 DM4 Family

| | | |
|-----------------------------------|---------------------------|---|
| Change of temperature | -55 / + 85 °C | IEC 61300-2-22 (λ =1310 / 1550 nm) |
| Low temperature | -55 °C (96h) | MIL-STD-810G (λ =1310 / 1550 nm) |
| High temperature | +85 °C (96h) | MIL-STD-810G (λ =1310 / 1550 nm) |
| Humidity | 95% r.h. / 10 cycles | MIL-STD-810G (λ =1310 / 1550 nm) |
| Temperature shock | -55 / + 85 °C | MIL-STD-810G (λ =1310 / 1550 nm) |
| Low pressure / altitude | 110 mbar /15240 m | MIL-STD-810G (λ =1310 / 1550 nm) |
| Vibration | 10/2000 Hz (3h) | MIL-STD-202G (λ =1310 / 1550 nm) |
| Mating durability | 500 cycles | IEC 61300-2-2 (λ =1310 / 1550 nm) |
| Cable torsion | +/-180° / 25 cycles | IEC 61300-2-5 (λ =1310 / 1550 nm) |
| Flexing of strain relief | +/-90° / 25 cycles | IEC 61300-2-44 (λ =1310 / 1550 nm) |
| Static side load | 2N/90° (5min.) | IEC 61300-2-42 (λ =1310 / 1550 nm) |
| Cable retention on connector side | 800N on multi-fiber cable | IEC 61300-2-4 (λ =1310 / 1550 nm) |
| Cable retention on bulkhead side | 70N on simplex cable | IEC 61300-2-4 (λ =1310 / 1550 nm) |
| Fibre retention | 5N | IEC 61300-2-4 (λ =1310 / 1550 nm) |
| Shock | 1.2m / 26 drops | MIL-STD-810G (λ =1310 / 1550 nm) |



MIL-83526 DM4 features

- Rugged construction for highly reliable optical connections
- IP class: IP68 rated
- Easy ferrule front-face access for cleaning & inspection
- Keyed, self aligning, connector housing aides in “blind mating” applications
- Shell aluminum and hard eloxate, rubber handle
- Easy termini insertion and removal for field termination and repair



Mechanical specifications

MECHANICAL AND ENVIRONMENTAL CONDITIONS

| | | |
|--|---------------------------|---|
| Change of temperature | -55 / + 85 °C | IEC 61300-2-22 (λ =1310 / 1550 nm) |
| Low temperature | -55 °C (96h) | MIL-STD-810G (λ =1310 / 1550 nm) |
| High temperature | +85 °C (96h) | MIL-STD-810G (λ =1310 / 1550 nm) |
| Humidity | 95% r.h. / 10 cycles | MIL-STD-810G (λ =1310 / 1550 nm) |
| Temperature shock | -55 / + 85 °C | MIL-STD-810G (λ =1310 / 1550 nm) |
| Low pressure / altitude | 110 mbar /15240 m | MIL-STD-810G (λ =1310 / 1550 nm) |
| Vibration | 10/2000 Hz (3h) | MIL-STD-202G (λ =1310 / 1550 nm) |
| Mating durability | 500 cycles | IEC 61300-2-2 (λ =1310 / 1550 nm) |
| Cable torsion | +/-180° / 25 cycles | IEC 61300-2-5 (λ =1310 / 1550 nm) |
| Flexing of strain relief | +/-90° / 25 cycles | IEC 61300-2-44 (λ =1310 / 1550 nm) |
| Cable retention on connector side | 600N on multi-fiber cable | IEC 61300-2-4 (λ =1310 / 1550 nm) |
| Shock | 1.2m / 26 drops | MIL-STD-810G (λ =1310 / 1550 nm) |
| Tensile strength of coupling mechanism | 200 N | IEC 61300-2-6 (λ =1310 / 1550 nm) |

X-BEAM lens based connector

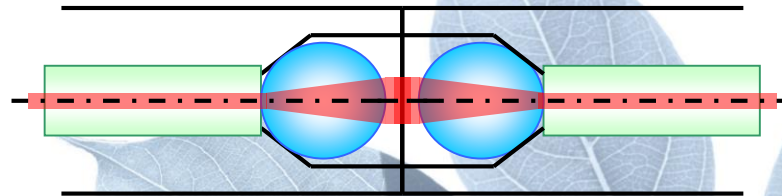
- Genderless tactical connector which uses lens based expanded beam technology for ease of cleaning and mating in outdoor applications
- The lens system also protects the fiber end face
- Compatible with MM & SM Tyco connectors
- Compatible with MM & SM Stratos connectors (For SM compatibility the X-BEAM is manufactured with special alignment)

X-BEAM OLB
(Optical Lenses Bulkhead)

X-BEAM OLC
(Optical Lenses connector)



The X-BEAM physically expands and collimates the transmission signal into an optical beam, which will then be reflected back onto the core of the receiving fiber. This concept provides an easy alignment and makes the transmission less sensitive to particles of dirt on the lens surface



X-BEAM features

- Rugged construction for high reliability
- IP 68 rated enclosure, IEC 60529 compliant
- Hermetic coupling (EN 1779 / DIN EN 13185)
- Intermateable with connectors compliant with MIL-DTL83526/20/21
- Low loss connection and high repeatability
- Genderless design to Simplifies mating
- Field repair and termination available with the Diamond *Fusion Crocodile Alberino*



X-BEAM Specifications



| | SPECIFICATIONS | UNITS | TEST CONDITIONS |
|------------------------|--------------------------|----------|--|
| Insertion Loss (IL) SM | typ. 0.9 max. 1.6 | dB | IEC 61300-3-34; $\lambda = 1310/1550$ nm |
| Return Loss (RL) SM | typ. 30 | dB | IEC 61300-3-6; $\lambda = 1310/1550$ nm |
| Insertion Loss (IL) MM | typ. 0.7 max. 1.3 | dB | IEC 61300-3-34; $\lambda = 1310$ nm; |
| Return Loss (RL) MM | typ. 25 | dB | IEC 61300-3-6; $\lambda = 1310$ nm |
| Operating temperature | -55/+85 | °C | IEC 61300-2-22 |
| Storage temperature | -55/+85 | °C | - |
| Damp heat, cyclic | +25°C/+55°C at +95% r.h. | - | IEC 61300-2-46 |
| Humidity | +30°C/+60°C at 95% r.h. | - | MIL-STD-810G / 507.5 / II |
| Dry Heat | +85 | °C | IEC 61300-2-18 |
| Cold | -55 | °C | IEC 61300-2-17 |
| Vibration, sinusoidal | 10 g / 10-2'000 Hz | - | IEC 61300-2-1 |
| Vibration, random | 5 gRMS / 10-2'000 Hz | - | MIL-STD-810G / 514.6 / I |
| Free fall | falls at 1.2 m | - | IEC 61300-2-12 |
| Bench handling | 10 cm at 45° | - | MIL-STD-810G / 516.6 / VI |
| Coupling endurance | 2500 couplings | - | According to field experience |
| Cable retention | 800 | N | IEC 61300-2-4 |
| Cable torsion | 25 N at +/-180° | - | IEC 61300-2-5 |
| Cable flexing | 15 N at +/-90° | - | IEC 61300-2-44 |
| Altitude | 9'145 | m | MIL-STD-810G / 500.5 / I |
| Bulkhead sealing | max. < 10 ⁻⁶ | mbar l/s | EN 1779 / DIN EN 13185 |

revos E-2000

- Robust IP65-rated enclosure
- ➔ *Dust-tight and protects against water jets*
- Integrated caps and shutters for Laser eye safety
- E-2000™ connector with Active Core Alignment
- ➔ *Exceptional optical performance*
- Easy lever locking
- Available for MM, SM (PC/APC), PM and small core fibers
- Available as terminated connector or fusion set for field assembly



SPECIFICATIONS

| | MULTIMODE 0° PC | SINGLE MODE 0° PC | SINGLE MODE 8° APC | UNITS | TEST CONDITIONS |
|------------------------------|------------------------|----------------------|-----------------------|-------|--------------------------------|
| Insertion Loss (IL) Standard | typ. 0.1 max 0.25 | typ. 0.1 max. 0.25 | typ. 0.1 max. 0.25 | dB | IEC 61300-3-4; λ = 1300/1550nm |
| Insertion Loss (IL) Fusion | typ. 0.25 max 0.5 | typ. 0.25 max 0.5 | typ. 0.25 max 0.5 | dB | IEC 61300-3-4; λ = 1300/1550nm |
| Return Loss (RL) | typ. 40 | min. 50 | min. 75* | dB | IEC 61300-3-6; λ = 1300/1550nm |
| Repeatability of IL | max. ±0.1 | | | dB | Over service life |
| Service life | 500 mate/demate cycles | | | | |
| Operating temperature | -40/+85** | | | °C | |

* Measured with high precision reflectometer

** May be further limited by cable specifications



- Rugged IP67 rated metal enclosure
- F-3000™ (LC compatible) SFF connector system
- Integrated caps and shutters
- Exceptional optical performance
- Available for MM, SM (PC/APC), with OCC cables
- Available as terminated connector or fusion set for field assembly
- Suitable for Sensing, Machine controls, Radar Systems

SPECIFICATIONS

| | SINGLE MODE 0° PC | SINGLE MODE 0° PC | SINGLE MODE 8° APC | UNITS | TEST CONDITIONS |
|-----------------------|------------------------|----------------------|-----------------------|-------|---|
| Insertion Loss (IL) | typ. 0.15 max. 0.5 | typ. 0.2 max. 0.5 | typ. 0.2 max. 0.5 | dB | IEC 61300-3-4; $\lambda = 1300/1550\text{nm}$ |
| Return Loss (RL) | typ. 40 | min. 50 | min. 80* | dB | IEC 61300-3-6; $\lambda = 1300/1550\text{nm}$ |
| Repeatability of IL | max. $\pm 0,1$ | | | dB | Over service life |
| Service life | 500 mate/demate cycles | | | - | |
| Operating temperature | -40/+85** | | | °C | |

* Measured with high precision reflectometer

** May be further limited by cable specifications

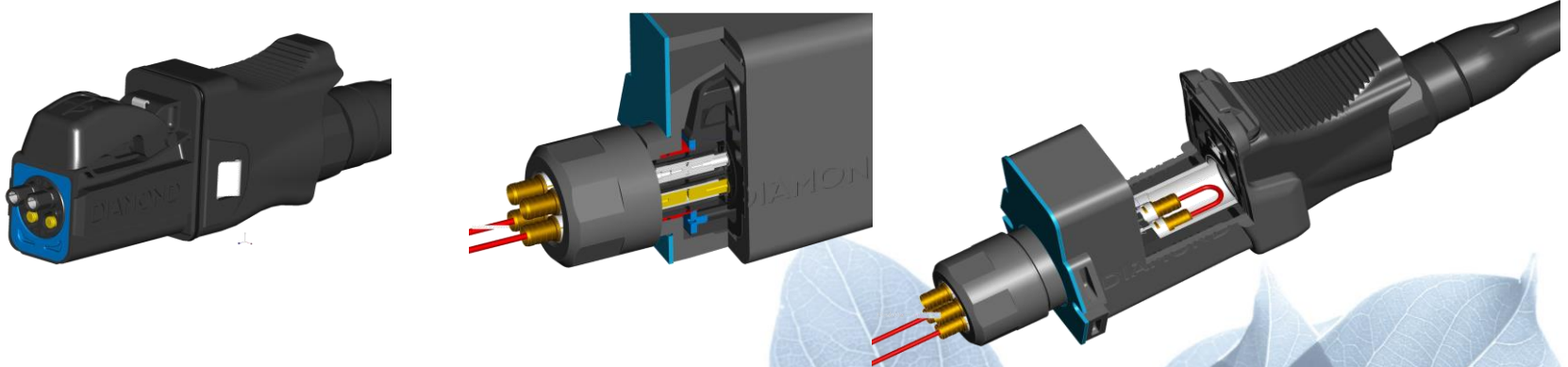


Products in the analysis study



Interlock for the DM4

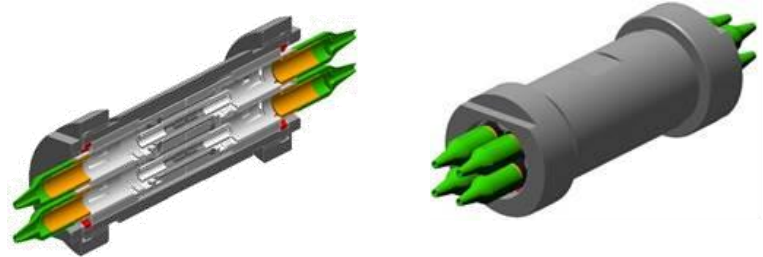
- To be able to give a deactivation security when using PS Technology
- Unfortunately we must sacrifice two optical fiber connections
- In the laboratory phase



Compact DM4



- We are creating a new concept with the DM4 and are currently developing the new Compact DM4.
- The optical performance will be the same as the MIL-38999 DM4 size 13, MIL-83526 DM4 and HE-2000 connectors.
- It does not have IP protection.
- Maximum Dimension: $\text{Ø}22,2 \text{ mm} \times \text{L } 52,2 \text{ mm}$.



Cerbero



- System to divide the fibers
- Possibility to Splice Fiber / Fiber
- Fixing special cable

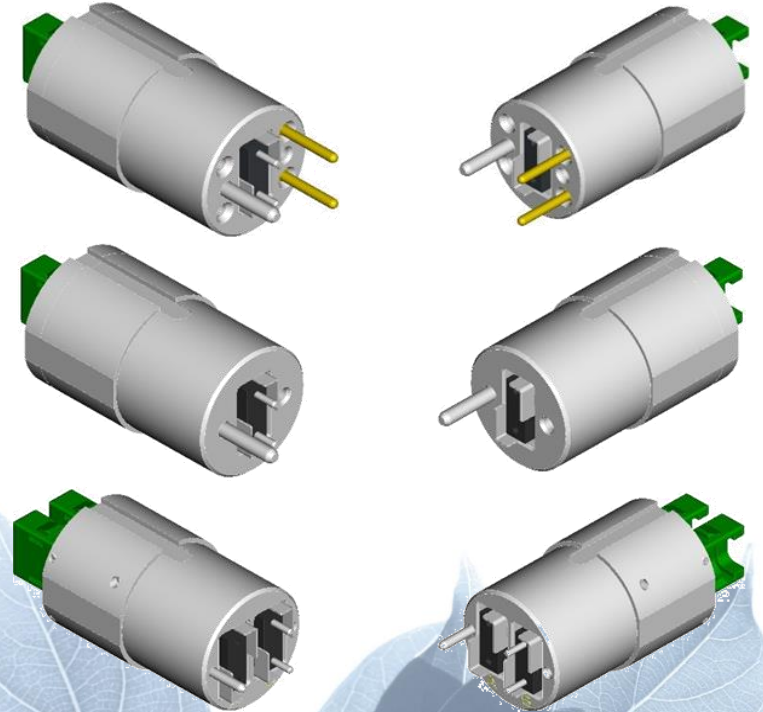


DM4 - MFS



Will be sent a Evaluation questionnaire to know:

- which insert can be interesting
 - 12/24 ch + 4 electrical pin
 - 12/24 ch
 - 24/48 ch
- In witch sector
- Quantity





Field installation & Services Cleaning & Inspection



Field installation and service

Diamond **ZEUS D50 HE** fusion splicer

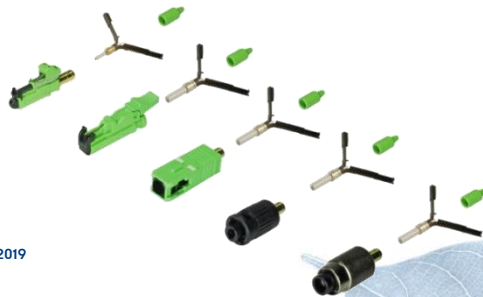
...fast, easy, high performance field termination and repair of:

Harsh Environment connectors:

- HE-2000, MIL-38999 DM4, MIL-83526 DM4, X-BEAM, OD3, revos E-2000

Splice-On Connectors (SOC):

- F-3000™, E-2000™, SC, ST, FC



The **Alberino HE** has no bi-adhesive and is therefore glue-based; this makes it more suitable for harsh environment application which are requesting to withstand severe conditions.

ZEUS D50 HE Features

- User friendly all-in-one system allows stripping, cleaving and splicing processes to be carried out in order to ensure safe cable manipulations
- Enhanced cable handling for 3-8mm outdoor/Mil cables thanks to special holders granting a higher splice yield
- Complete Kit of all the tools required to carry out all processes ranging from cable preparation to connector body assembly
- IP64 carrying case for use in harsh environments



Cleaning and inspection



DiaClean Features

- Easy to use, lightweight, robust and field-proven
- Contains all necessary tools for proper cleaning and inspection procedures to help ensure optimal connector performance.



Video Microscope Features

- Safe, reliable and quality system incorporating the performance of a laboratory microscope into a portable, easy-to-use field inspection tool.
- Up to 200/400x magnification for inspection of 1.25 & 2.5mm (PC/APC) mated & unmated connectors
- Inspection probe with USB connection for Laptop application



For more infos, visit www.diamond-fo.com



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Product Finder

E-2000™ Connector

Thanks to its different technologies, mechanical and optical interfaces, the E-2000™ fiber optic connector family can cover the most standard and customized requirements in response to the increasingly customer demands.

[Read more](#) →



DIAMOND Fiber optic solutions