Amphenol
MILITARY & AEROSPACE

ENABLING THE ELECTRONICS REVOLUTION

Amphenol Harsh Environment Fibre Solutions

Amphenol Military & Aerospace Operation (AMAO)

Emmanuel LAMBERT
Fiber Optic Product Group Manager / Business Division Security Defense / +33 (0) 6 80 58 58 10 / emmanuel.lambert@amphenol-socapex.fr

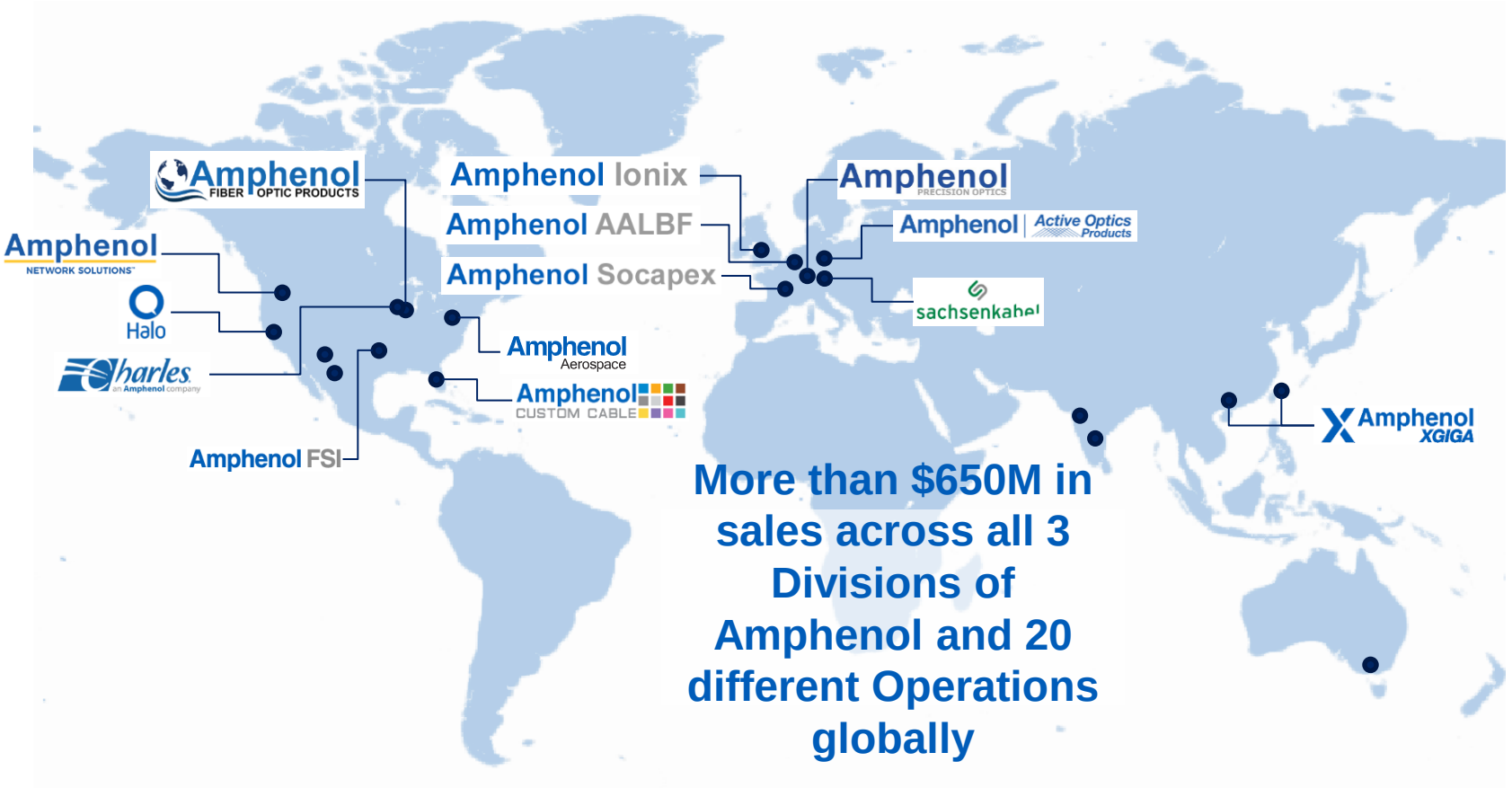
Amphenol SOCAPEX, 948, promenade de l'Arve, BP29 ; 74311 THYEZ Cedex France ; amphenol-socapex.com | amphenolmao.com

The Amphenol Value Proposition

- **Largest and most diversified product portfolio: Singlemode, Multimode, High density, Physical contact and Expanded beam or a combination of these…**
- **Broadest technology portfolio: Ability to provide solutions for multiple applications and markets segments.**
- **Core competences in fibre optics for harsh environment conditions (Temperature, Vibration, optical performance and robustness including SWAP**
- **Ability to supply concept & product design/development, testing, qualification and manufacturing over the life of the program.**
- **Mature and emerging product lines, with healthy focus on new product development**

Broad and Diverse Product Portfolio

Global Presence in Fibre Optics



AMAO serves all the key military and aerospace markets

Military & Commercial Airborne

Naval

Ground Vehicles & Radar

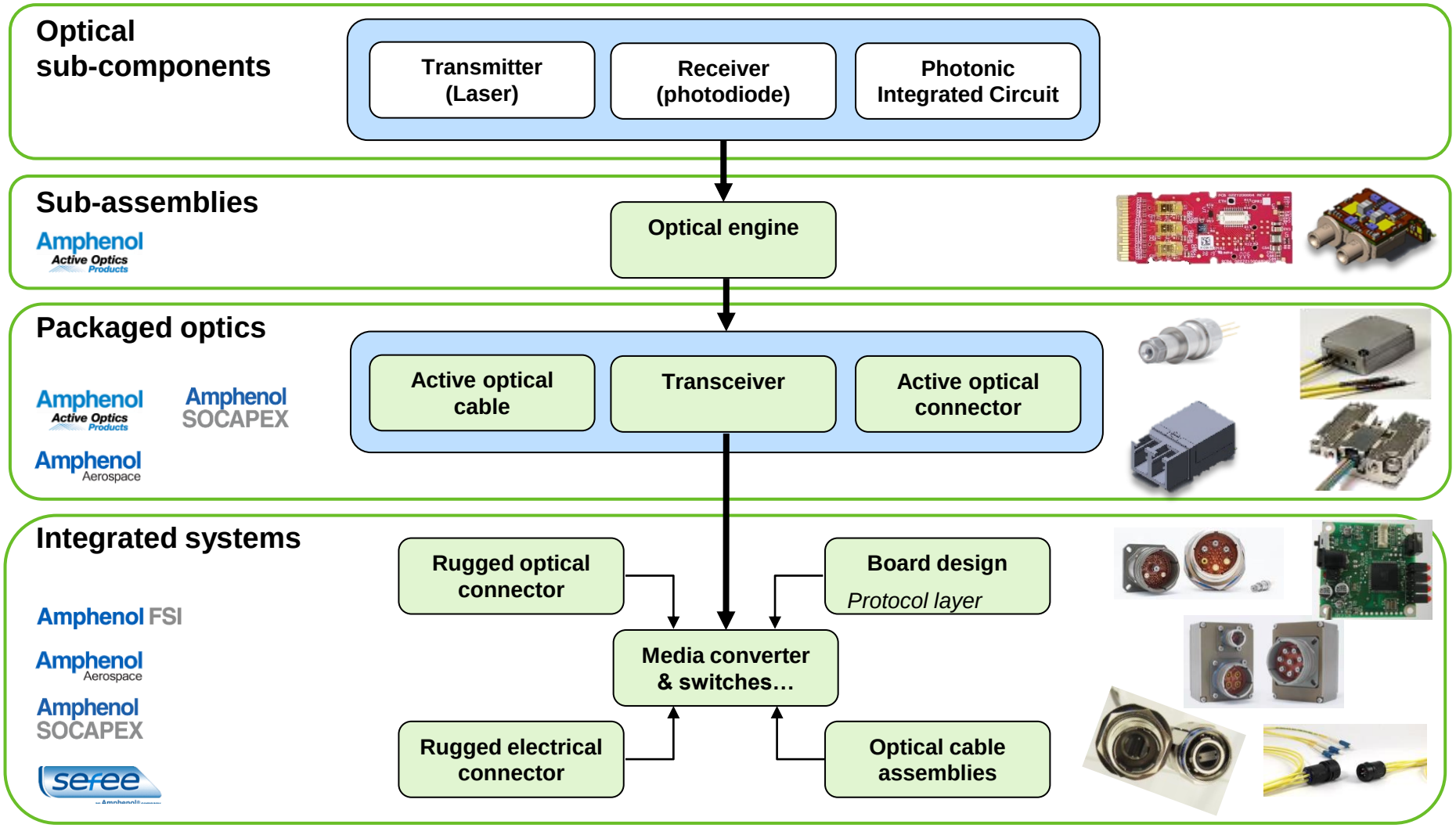
Industrial

Space

Test & Measurement

Wireless communication

Active Optics at AMAO at a glance



Key HEFO Products

Cable Assemblies

Fibre/Hybrid Connectors

PC and EB Connectors

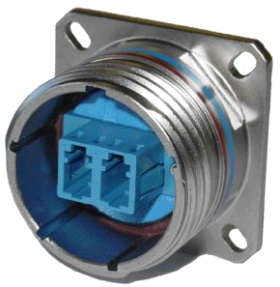
Termini

Media Converters

Ethernet Switches

LC FIELD

Applications
D38999 Series III
Semi Harsh Environments
Railway, Base station, Military communication



Performance
Insertion loss MM <0.5dB MM/SM
Repeatability <0.2dB
Mating durability >500 matings

Feature	Advantage
D38999 Series III based design size 19	Industry proven
Ratchet Coupling mechanism	High Vibration
Scoop-proof interface	No damage on optical surface
Upgrade LC cable assembly	No termination required
LC Duplex Physical Contact Ceramic	Proven Optical Technology MM & SM, 2 channels

ASF Size 13 38999 + Standard MTP/MPO

+

MTP / MPO Cable

MIL DTL 38999
Series III #13 shells

=

MPO Field TV

Applications
D38999 Series III
Semi Harsh Environments
Railway, Base station, Military communication

Performance
Insertion loss MM <0.5dB MM/SM
Repeatability <0.2dB
Mating durability >500 matings

Feature	Advantage
D38999 Series III based design size 13	Industry proven
Ratchet Coupling mechanism	High Vibration
Scoop-proof interface	No damage on optical surface
Upgrade MPO cable assembly	No termination required
MPO with MT ferule composite	Proven Optical Technology MM & SM, 12 or 24 channels

ARINC 801

Butt Joint Fiber Optic connector

Applications
Semi harsh environment
Shipboard applications
Avionics

Performance
Insertion Loss <0.5dB
Multimode & Singlemode
Repeatability <0.15dB
Durability 500 matings

Feature	Advantage
ARINC801 standards	Industry recognised
Ratchet Coupling mechanism	High Vibration
APC Ferrule	RF over Fibre
D38999 footprints	Supports D38999 backshells and accessories

Butt Joint – PROMI

Fiber Optic Inline Extender for 2 x ARINC 801

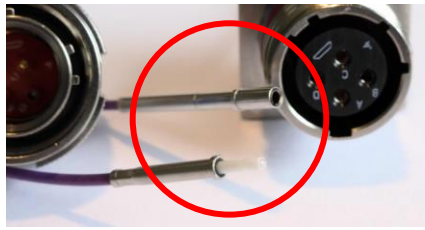
PROMI

Easy Installation & Easy Repairability

For easy installation & maintenance, the PROMI is the solution for optical link in harsh Environment.
The PROMI (In Line Miniature Optical Adapter) may be used on patchords already in place. For a reduced space, where the connector is not suitable, the PROMI allows the division of the link into several sections.
This optical Miniature extender PROMI realizes a very compact removable splice

LUX-BEAM #16 // EN 4869

Expanded Beam Single expanded beam termini



- Expanded Beam technology :
  - Surface expanded bundle >144X
  - Reduced sensitivity to dust : reliability
  - No degradation of the optical face
  - Easy installation
  - Easy cleaning
  - Low maintenance
- Compatibility :
  - Cavity #16, MIL-DTL-38999 series III, EN3645
- Other benefits technology :
  - Easy installation with standard tools
  - Possibility to mix with Electrical contact for Hybrid solutions
- Fiber Type :
  - Multimode 50/125, 62,5/125

TECHNICAL DATA

SPECIFICATION	MEASUREMENT DETAILS	STANDARD	METHOD
INSERTION LOSS	2.0dB max multimode, 850nm 2.0dB max multimode, 1300nm	MIL-PRF-29504D	TIA-455-34
MATING DURABILITY	500 cycles	MIL-DTL-38999	TIA-455-21
OPERATING TEMPERATURE, TEMPERATURE LIFE	125°C 1000H	MIL-PRF-29504D	TIA-455-04
STORAGE TEMPERATURE	-40°C / +85°C	MIL-PRF-29504D	
TEMPERATURE CYCLING	5 cycles -40°C +70°C	MIL-DTL-38999	TIA-455-03
THERMAL SHOCK	5 cycles -55°C +125°C	MIL-PRF-29504D	TIA-455-34
HUMIDITY	24h at 50°C max 33% hum 240H at 40°C 90% RH	MIL-DTL-38999	TIA-455-05
SALT SPRAY	48H	MIL-PRF-29504D	TIA-455-16
VIBRATION	Connectors mated Method B: Figure 2, Table 1, level J (1g2/Hz) Duration: 8h / axe – 2 axes longitudinal and perpendicular direction. Duration of micro-discontinuity: < 1µs IL max 2dB.	EN2591-6403	
SHOCK	Method A, severity 100 Number of shocks: 1 each way for each of the 2 directions (6 shocks in all). Duration of micro-discontinuity: < 1µs	EN2591-6402	
INSERTION AND REMOVAL FORCE	max 22 pounds	MIL-PRF-29504D	3.6.9
MAINTENANCE AGING	10 insertions / removal cycles	MIL-PRF-29504D	3.6.13

EN 4869 DERIVATED TERMINI DUPLEX LUXBEAM

DX-BEAM – Duplex Expanded Beam MM contact size 16

- Expanded Beam technology :
  - Surface expanded bundle >144X
  - Reduced sensitivity to dust : reliability
  - No degradation of the optical face
  - Easy installation
  - Easy cleaning
  - Low maintenance
- Compatibility :
  - Cavity #16, MIL-DTL-38999 series III, EN3645
- Other benefits technology :
  - Easy installation with standard tools
  - Possibility to mix with Electrical contact for Hybrid solutions
- Fiber Type :
  - Multimode 50/125, 62,5/125

Duplex LUX-BEAM™ #16 MM - contact cavity # 8 (quadrax)

(Optical design based on Plano Convex Lens Technology)

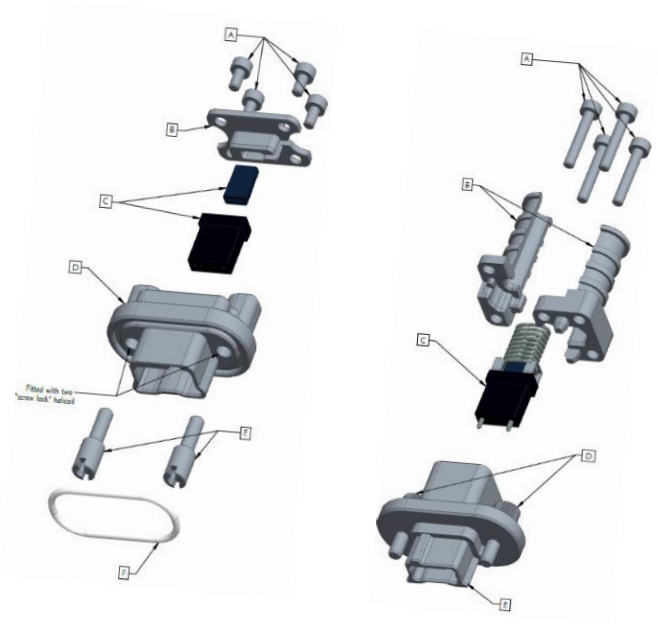
Duplex LUX-BEAM™ Male contact Quadrax Cavity

Duplex LUX-BEAM™ Female contact EN 3645 Size 7

New Product – AALBF Aerospace grade FO connector

- Applications
  - Space/Aerospace
  - Military Comms
  - Radar
  - Rugged Data Centre's
- Performance
  - Operating Temp: -55° to +125°C
  - IL: <0.5dB per Channel
  - RL: >20dB
  - Shock: Peak 75g 11ms
  - Random PSD 2.2g²/Hz between 100 and 300Hz 7.5 Min/Axis
- Additional Features
  - Capable of upto 48 Fibres
  - SM and MM compatible
  - SM APC
  - Lensed MT compatible

UP TO 48 CHANNELS



AVAILABLE: END Q4 2022

ASF Size 7 38999 + Standard MT ferrule

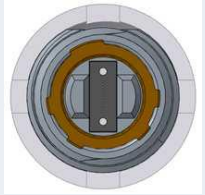
- Shell size : #7, reduced flange
- Key point: Uses special # 7 shells but standard MT
- Present Status : & samples OK
- Qualification : Evaluation has been done
  - Electrical Size 7 38999 has been qualified to MIL-DTL-38999 Series III,
  - Additional tests will be done for the optical MT version
  - We will complete testing for the MT comparable to the tests we will be doing for the MPO Field
- Market launch : Q4 2023

Test	Sample	
	Singlemode	Multimode
1- Insertion Loss	✓	✓
2- Mechanical Endurance	✓	✓
1- Insertion Loss	✓	✓

- MT size 7 For Space Market : (estimated qualification 1-2 years)
  - Shell 38999 + ferule MT need to be qualified with the following standard : ESCC 3401/056
    - Outgassing
    - Tracability
    - LAT : Lot Acceptance Test

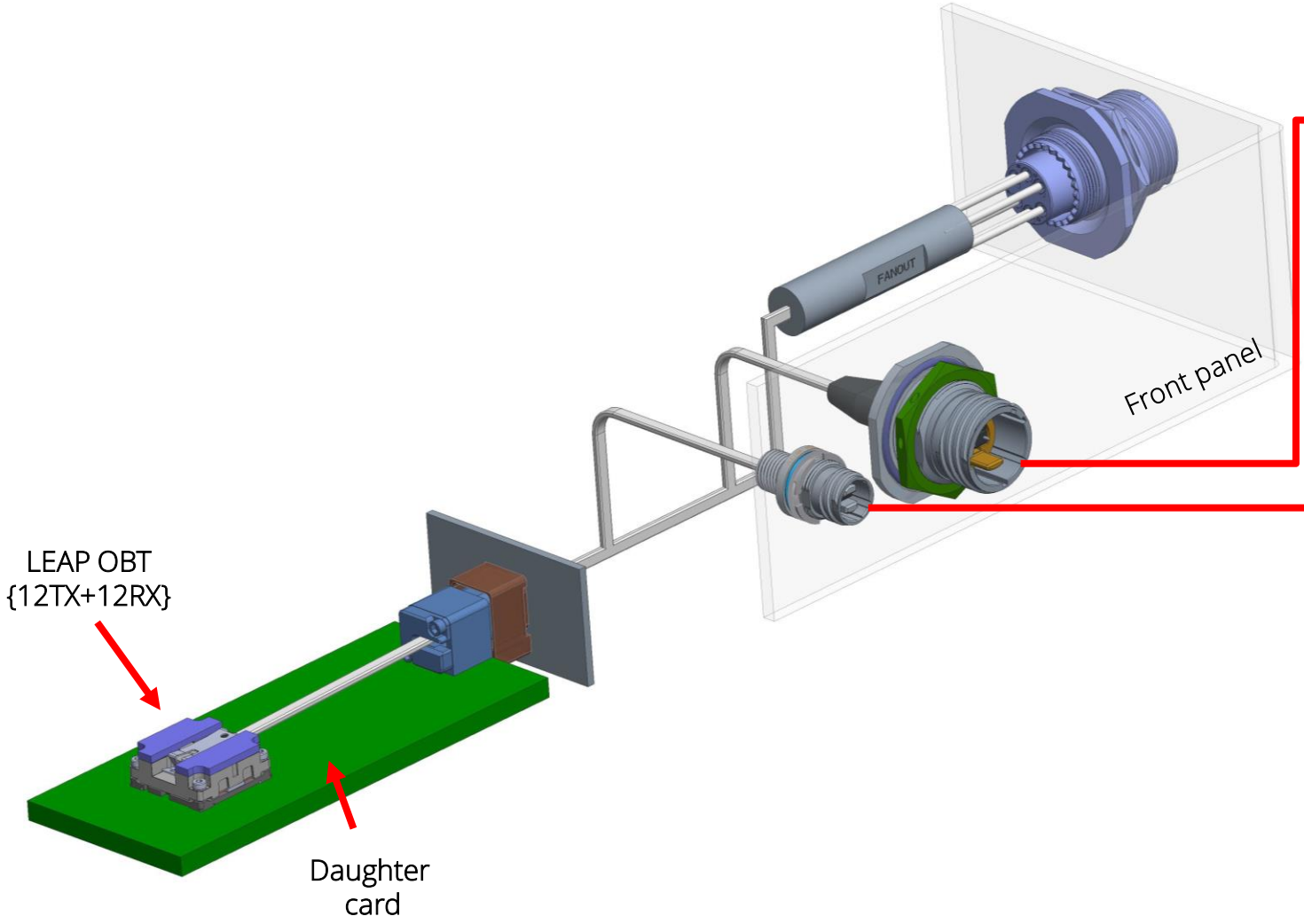
387TV 07 MT
F312
Jam Nut Receptacle
Reduce Flange
TV T7

Outer Diameter
Ø17mm Max



AMAO fiber optics end-to-end solutions - w/ rugged circular inter-connects -

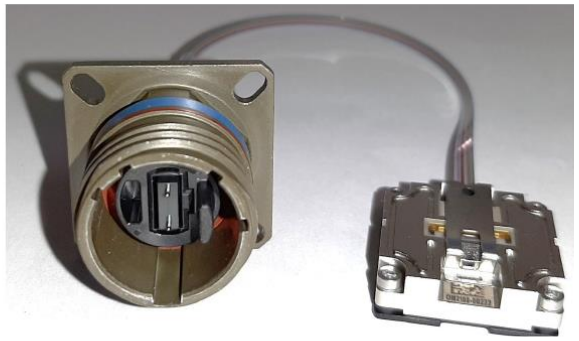
38 999 with MT or MPO insert (12 to 24 channels)



MPO field
38999 size 13 +
MPO connectors

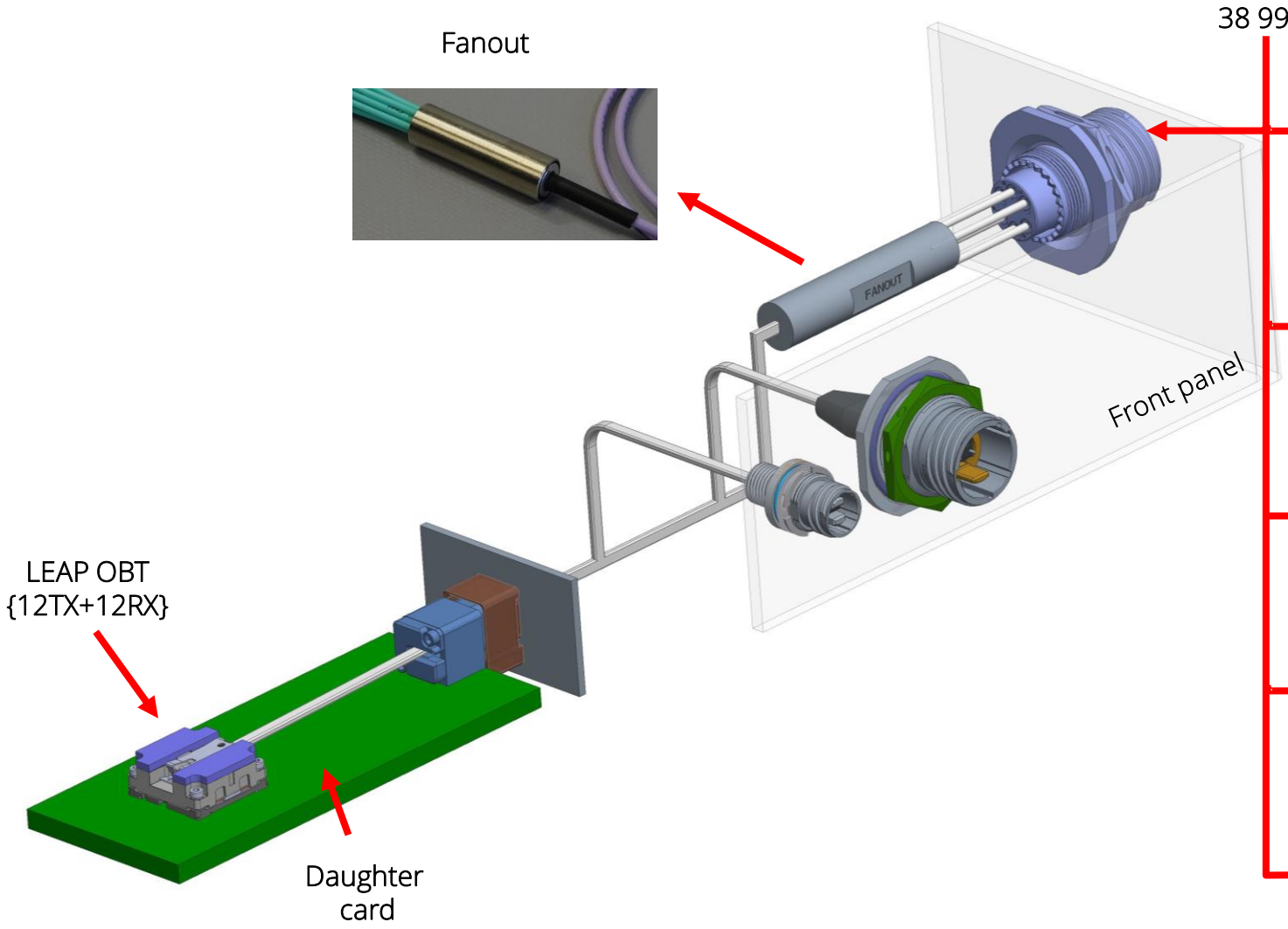
Size 7 MT
38 999 size 7 +
MT ferulle

MPO field + OBT (24 channels)
MPO + Shell 38 999 size 13



AMAO fiber optics end-to-end solutions - w/ rugged circular inter-connects -

38 999 / 8 to 24 channels



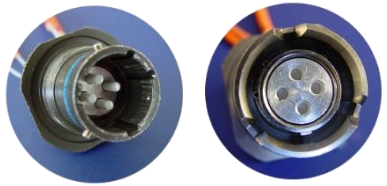
TV + 29504/4 & /5
38 999 Shell
Ceramic Optical termini
29504 (butt joint)

38 999 Luxbeam #16
38999 + Optical termini
Luxbeam #16 EN4869
Expanded beam termini

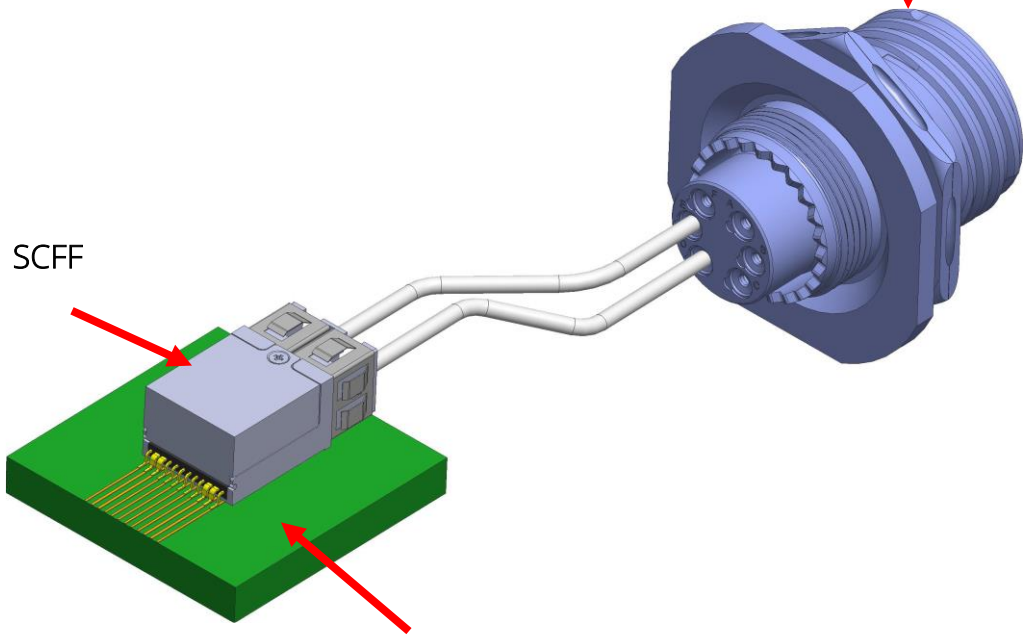
ARINC 801
38 999 shell
ARINC 801 insert
& ceramic optical termini 1,25mm
Butt joint

TVOP
38 999 shell
Ceramic optical termini 2,5mm
Butt joint

RNJOP
RNJ Circular Rackable connector
Ceramic optical termini 2,5mm
Butt joint



AMAO provides end-to-end FO solutions
- SCFF to 38 999 discrete channel connectors -



38 999 - 1760 + Luxbeam #16
Lanyard connector 25-20
Luxbeam #16 EN4869

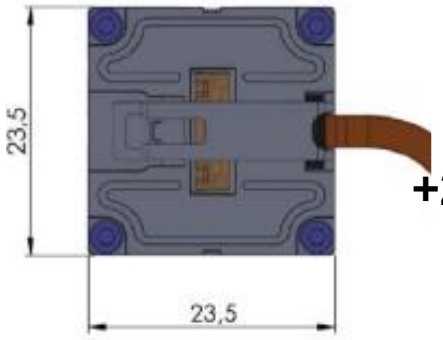
38 999 Size 7 + Double Luxbeam
38999 size 7 +
Double Luxbeam Q8D
Expanded beam optical termini

LC field
LC duplex + Shell 38 999 size 19

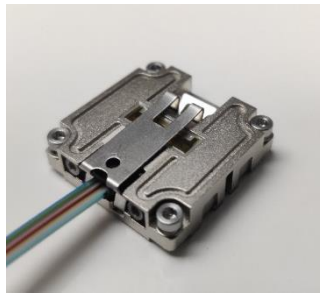
Leap® OBT {12Tx+12Rx} board-mount rugged optical transceiver

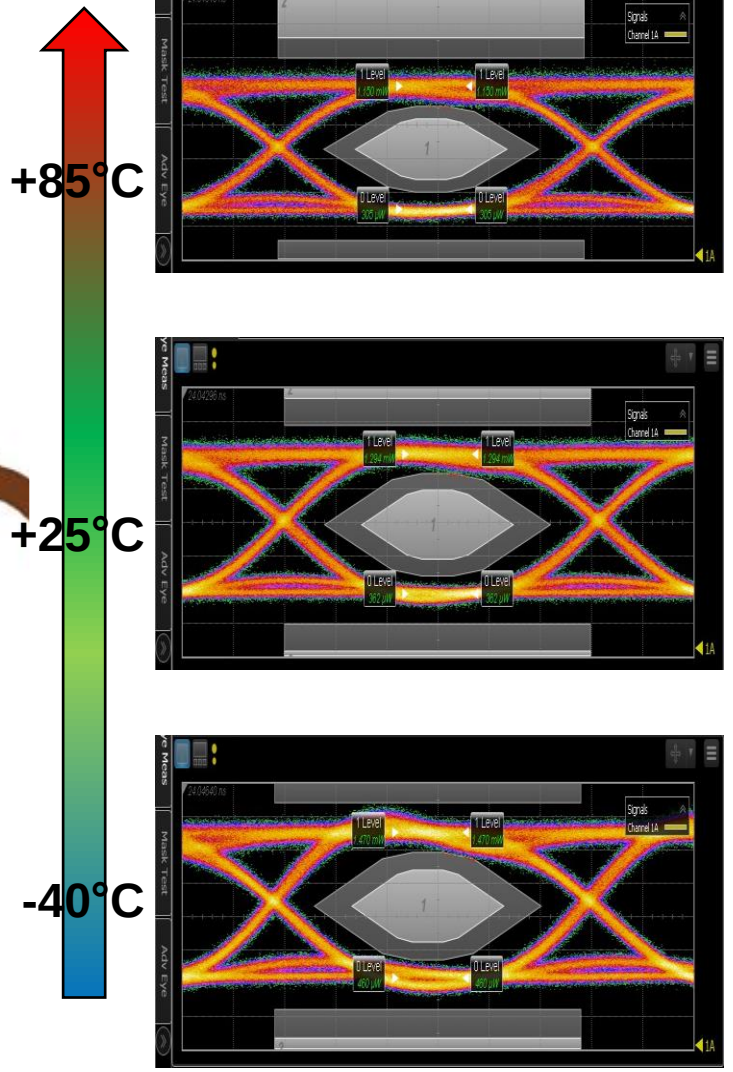
Overview

- Product specification
  - 12x25Gbps full duplex **-> 300Gbps duplex aggregate**
  - Up to 100m reach over MMF; Laser Class 1M or 3B
  - **-40°C to 85°C operating temperature**
  - **MIL-STD-883: Shock Method 2002.4 (500g; 1ms), Vibe Method 2007.3 (20g sine)**
  - Bit error rate < 10^{-12} (no FEC needed)
  - Power consumption:
    - 10Gbps @12TRx: <3.5W
    - 25Gbps @12TRx: <5.4W
- Functionalities
  - Accessible through two-wire serial interface (I2C)
  - Digital monitoring (temperature, voltage, RSSI)
  - Programmable CDR (for 25GbE operation)
  - Programmable input equalization, output amplitude, pre-emphasis
  - Customized cooling design
  - Standard MT-ferrule interface (24 fibre MT ferrule)



Dimensions in [mm]

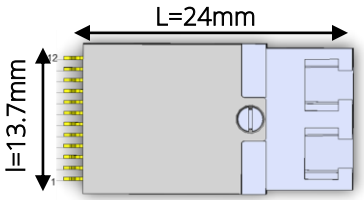


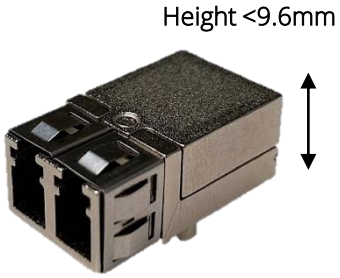


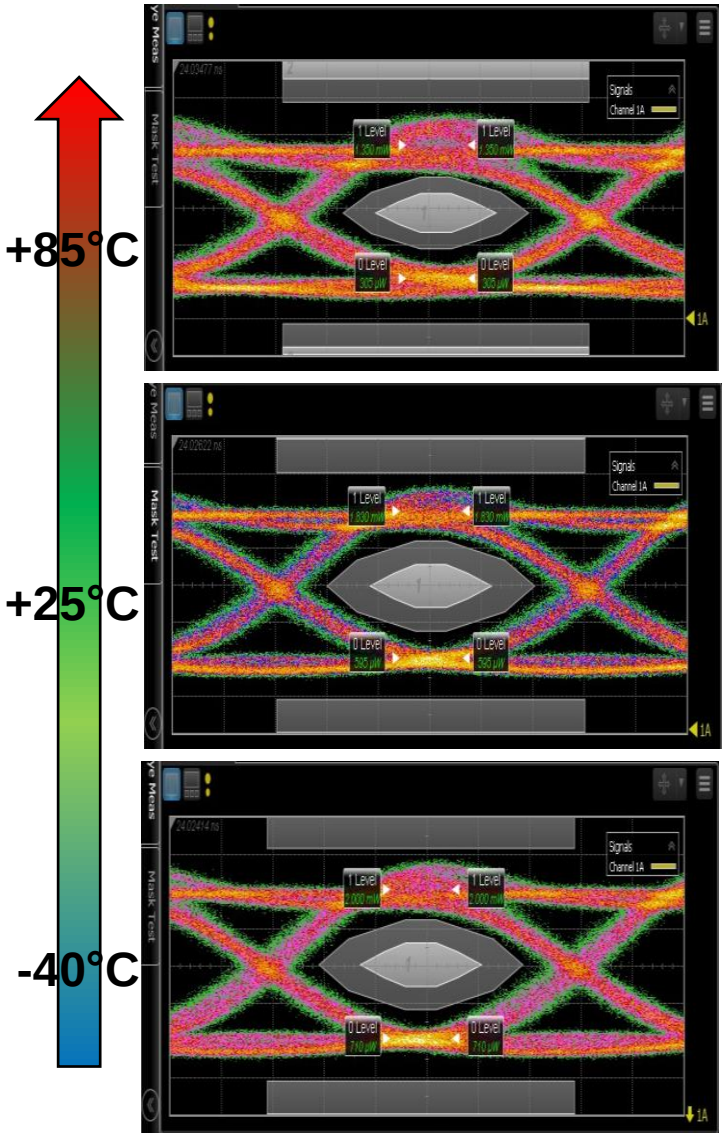
SCFF {1Tx+1Rx} 25Gbps board-mount rugged optical transceiver

Overview

- Product specification
  - 1x25Gbps full duplex (from 1Gbps to 28Gbps)
  - Up to 100m reach over MMF; Laser Class 1M or 3B
  - **-40°C to 85°C operating temperature**
  - **MIL-STD-883: Shock Method 2002.4 (500g; 1ms), Vibe Method 2007.3 (20g sine)**
  - Bit error rate < 10^{-12} (no FEC needed)
  - Power consumption:
    - 10Gbps @12TRx: <3.5W
    - 25Gbps @12TRx: <5.4W
- Functionalities
  - Accessible through two-wire serial interface (I2C)
  - Digital monitoring (temperature, voltage, RSSI)
  - Programmable CDR (for 25GbE operation)
  - Programmable input equalization, output amplitude, pre-emphasis
  - Die-cast housing for optimal thermal dissipation

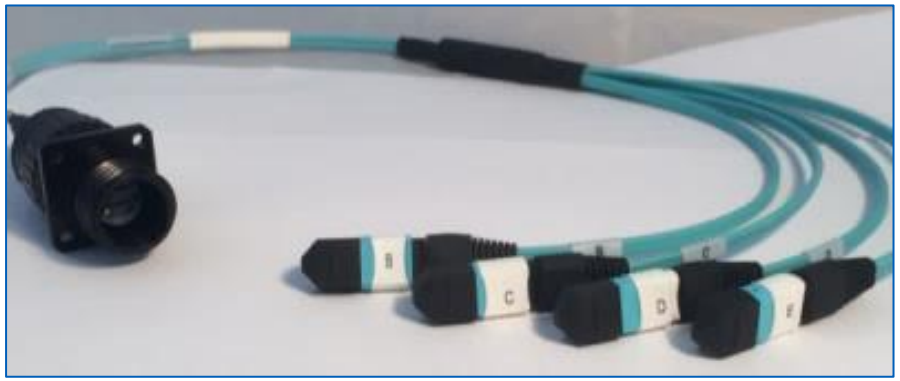




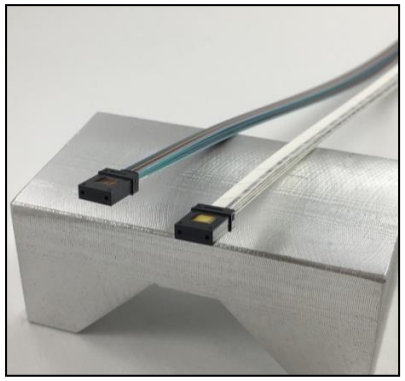


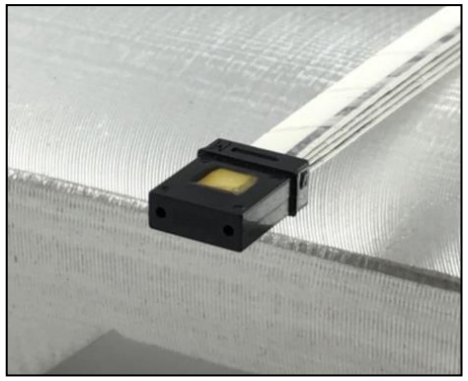
AMAO fiber optics end-to-end solutions
- w/ harsh environment FO cabling solutions

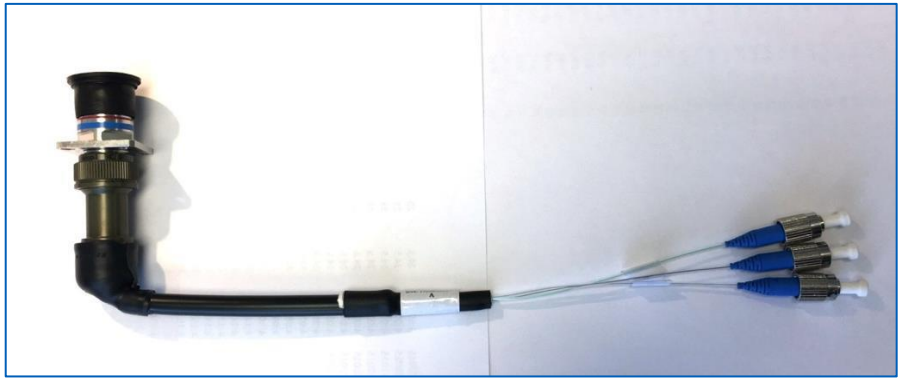
38 999 Multichannels or MT to MPO/MTP
24 Channels crossover



MT38999with fanout and
single channel termini







MT Ferrule 48Channels
Termination capabilities

38 999 MT Right angle backshell

Ethernet switches & Media Converters
- Range Overview -

Rugged
Waterproof
MIL-STD
STANAG

Ethernet Switches

Media converters
Fibre optic to copper

Junction boxes

Contact

Fiber Optic Business development Manager :

Noel THORNTON
Amphenol EMEA
n.thornton@amphenol-roe.eu
+44(0)7.342.037633

Fiber Optic Product Group Manager :

Emmanuel Lambert
Amphenol Socapex
emmanuel.lambert@amphenol-socapex.fr
+33(0)6.80.58.58.10

Thank You!

Any Questions