

# PL-4000M

## 400G Muxponder



**Aggregation of flexible mix of services into a 400G DWDM uplink**

### Features Overview

- Flexible high capacity architecture based on 400G pluggable digital coherent optical modules
- Supported clients: 10/25/100Gb Ethernet, 16/32G Fibre Channel, OTU2/OTU2e, OTU4
- Flexible mix of client services mapped into a single 400G DWDM wavelength
- Supported FEC modes on the line side:
  - C-FEC
  - O-FEC
- Standard MSA pluggable modules:
  - Uplink: 400G CFP2-DCO or QSFPDD-DCO ZR/ZR+
  - Clients: 4 x QSFP28 for 100GbE or OTU4, 24 x SFP+ / SFP28 for all others
- Layer-1 GCM-AES-256 encryption
- Elliptic Curve Diffie-Hellman key exchange
- Comprehensive line and service performance monitoring
- Integrated EDFAs pre-amp/booster (optional)
- Facility protection using an integrated optical switch (optional)
- Remote management using in-band GCC or out-of-band OSC
- Easy maintenance with field-replaceable parts:
  - Dual hot pluggable power supply units (AC/DC)
  - Fan unit

### 400G Metro and 200G Long Haul Applications

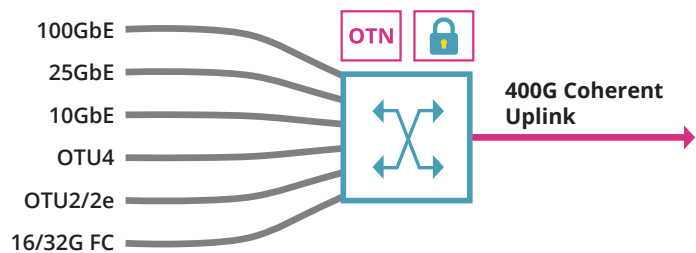
The PL-4000M is a modular and cost-effective solution for rolling out multi-rate 10/25/100GbE, 16/32G FC, OTU2/2e/4 services, or increasing existing network capacity. The device delivers 400G in a 1U chassis using two uplink variants - 400G pluggable CFP2-DCO module for coherent metro and long haul applications, or QSFPDD-DCO module for short haul / DCI metro applications.

### Main Benefits

- Cost-effective high capacity transport of 400G over single wavelength
- Supports flexible mix of client interface protocols
- Embedded Layer-1 GCM-AES-256 optical encryption
- Integrated EDFAs and optical switch in 1U chassis
- User-configurable 200G/400G operation mode

### Flexible Architecture, Facility Protection Support

The PL-4000M provides full demarcation point between the service and the OTN/DWDM uplink, and is interoperable with any third party switch or router. This provides full visibility and performance monitoring of both line optical transport layer (OTN) and 10/25/100GbE, 16/32G FC, and OTU2/2e/4 service interfaces.



400G Muxponder Diagram

### Recommended for the following applications:

- 400G metro and long haul applications ranging up to 1,200km
- 200G long haul applications ranging up to 2,500km
- High capacity DCI for enterprise, campus and cloud computing networks
- 400G links to bolster existing OTN/DWDM infrastructure
- Last mile access/aggregation CPE for 100GbE managed services
- Secured and encrypted communication for 10/25/100GbE and 16/32G FC services



Layer-1  
encryption



1U rack mount



Cost effective  
solution

## Technical Specifications

### Product Configurations

**400G Muxponder:** Flexible mix of client interfaces aggregated into a 400G uplink

**Optical Amplifiers:** Up to two EDFA modules (optional)

**Optical Switch:** 1+1 facility protection (optional)

### Uplink Characteristics

#### Bit Rate:

- 400G OTUC4
- 200G OTUC2

**Optical Interface:** CFP2-DCO or QSFPDD-DCO 400G uplink

#### Tuneability Range:

- DWDM ITU-T G.694.1 Grid
- C-band, with flex-grid support

#### FEC Support:

- C-FEC
- O-FEC

#### CFP2-DCO:

- Tx power 400G: -10dBm to 0dBm
- Rx power 400G: -23dBm
- 400G 16QAM OSNR Tolerance at -12dBm Rx Power: typical 21.8dB, worst case 22.8dB
- 200G QPSK OSNR Tolerance at -17dBm Rx Power: typical 13.9dB, worst case 14.9dB
- Rx Sensitivity at High OSNR: 400G 16QAM -22.5dBm, 200G QPSK -30dBm

#### QSFPDD-DCO:

- Tx power 400G: -10dBm
- Rx power 400G: -20dBm
- 400G 16QAM O-FEC OSNR Tolerance at -12dBm Rx power: typical 21.3dB, worst case 22.3dB
- 400G 16QAM C-FEC OSNR Tolerance at -12dBm Rx power: typical 24dB, worst case 26dB
- 200G QPSK OSNR Tolerance at -17dBm Rx Power: typical -13.7dBm, worst case -14.7dBm
- Rx sensitivity at high OSNR: 400G 16QAM/O-FEC -23dBm, 400G 16QAM/C-FEC -20dBm, 200G QPSK -30dBm

#### Chromatic Dispersion Tolerance:

- 400G: 26,000ps/nm
- 200G: 50,000ps/nm

#### Optical Monitoring:

- Tx and Rx power
- Chromatic dispersion
- OSNR

### Client Characteristics

#### Service Types:

- 10GbE, 25GbE, 100GbE
- 16G/32G Fibre Channel
- OTU2, OTU2e, OTU4

#### Optical Interface:

- QSFP28: LR4/ER4 (1310nm), SR4 (850nm), CWDM4
- SFP+/SFP28: LR (1310nm), SR (1310nm), ER (850nm), ZR (1550nm), C/DWDM

#### Amplifier

**Applications:** Booster, pre-amp

#### Output Power:

- Booster: up to 20dBm
- Pre-amp: up to 5dBm

#### Input Power:

- Booster: -24dBm to +10dBm
- Pre-amp: -36dBm to -10dBm

#### Gain:

- Booster: 5dB to 22dB
- Pre-amp: 13dB to 22dB

#### Operating Modes:

- Automatic gain control (AGC)
- Automatic power control (APC)

### Network Management

#### Management Ports:

- 2xRJ-45 LAN port 100/1000MBase-T
- 2xSFP MNG ports 100/1000MBase-X
- RJ-45 serial port
- RJ-45 external alarm port
- OTN in-band GCC channel

**Protocols:** SNMP, HTTP, HTTPS, Telnet, SSH, Syslog, RADIUS, TACACS, SNMP, TFTP & SFTP

#### Management:

- Web browser over HTTP/HTTPS,
- PacketLight LightWatch™ NMS/EMS, or third party NMS over SNMP
- CLI over RS-232 or CLI over Telnet/SSH

#### OAM:

- Facility loopback (client and line interfaces), terminal loopback, PRBS, event log, alarms

#### Performance Monitoring:

- Layer-1/2 PM for 10/25/100GbE services
- OTN PM for uplink and OTU2/2e/4 services
- Optical PM for all optical ports

**Visual Indicators:** LED status indicators for client and line ports, Management and LAN ports, amplifier/s, system

Critical/Major/Minor and Power Supply

**Software Upgrade:** Hitless traffic – dual image

### Power Supply

**AC/DC:** 100 to 240 VAC, 50/60 Hz, -36 to -60 VDC, 300W max

**PSU Redundancy:** Single/dual feeding, hot swappable

**Cooling Unit:** Hot swappable fan unit

### Environmental

**Operating Temperature:** -5°C to 50°C

(+23°F to +122°F) operational

**Humidity:** 5% to 85% RH

### Physical Dimensions

#### 1U:

- 1.77" (H) x 17.32" (W) x 15.75" (D)
- 45mm (H) x 440mm (W) x 400mm (D)

**Weight:** 13kg / 28.66lb (max)

**Mounting:** 19", ETSI and 23"

### Encryption

**Functionality:** Full speed, transparent Layer-1 encryption for selected services or for the 400G OTUC4 uplink

#### Compliance:

- FIPS 140-2 Level 2
- CNSA Top Secret Suite 2015

#### Algorithms:

- Encryption/decryption: GCM-AES-256
- Key exchange: ECC CDH, Curve P-384
- Message digest: SHA-384

#### Authentication:

- Role-based user/password authentication

**Note:** For specific countries, models that include Layer-1 GCM-AES-256 based encryption will be marked with the suffix C.

### Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready