

DIAMOND

Fiber Optic Components

PM-PS

(Polarization Maintaining and Power Solution)

OPTICAL INTERFACE

PRELIMINARY

The continuous growth in the laser world has broadened the requirements for more complex and performing systems. Specific applications demand the combination of multiple features that may allow supporting polarization maintaining (PM) properties in the presence of higher optical power densities. Diamond offers power solutions (PS) optical interfaces that support both requirements. The PM-PS interface addresses the reliability issues related to optical power densities close or above the damage (or safety) threshold for single mode fibers and the propagation of polarization information. This contact solution can be implemented on all connector types carrying a keying mechanism for polarization orientation purposes and it is compatible with Diamond's Power Solution technology.

APPLICATION FIELDS

The field of application of PM-PS elements is expanding due to the novelty of the solution.

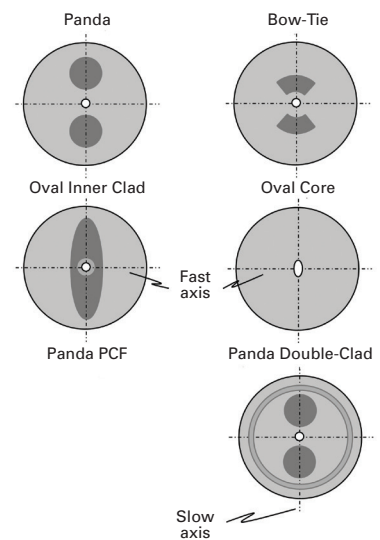
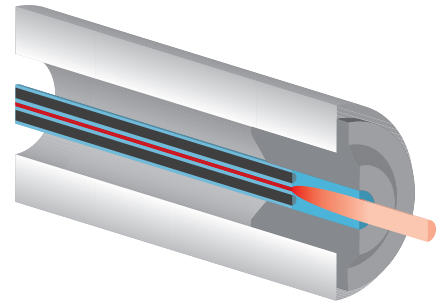
- ▶ Lidar
- ▶ Optical fiber laser systems and amplifiers
- ▶ Sensing

FEATURES AND BENEFITS

- ▶ Low Insertion loss thanks to ACA
- ▶ Ultra high polish for High return loss
- ▶ Improved power resistance (x16)
- ▶ Extremely low angular offset
- ▶ High Extinction Ratio thanks to APOn

Diamond uses 0.1dB-grade ferrule with diameter tolerances $< 0.2 \mu\text{m}$, and front face geometry that exceeds the current international standards:

- ▶ Ferrule radius $10 \div 20 \text{ mm}$
- ▶ Core apex $< 62.5 \mu\text{m}$
- ▶ Fiber protrusion $-50 \div 200 \text{ nm}$ (negative undercut)



STANDARD PERFORMANCES

WAVELENGTH (nm)	Angular Error ϕ	IL (dB)		PER (dB)		RL (dB)	
		Typ	97% (TBC)	Typ	Min (TBC)	PC 0°	APC 8°
1625 - 1550 - 1310 1060 - 980	$< \pm 2^\circ$	0.4 0.6	0.8 1	25 23	20 20	45* 35	70* 60*
TEST CONDITIONS		IEC 61300-3-34 Random mating		IEC 61300-3-40 Low coherence		IEC 61300-3-6 *OLCR method <OCWR method	
Lifetime		500 mate/demate cycles					

- Optical values specified at room temperature, and based upon high-quality Panda and fibers qualified by Diamond (fiber's NA 0.12 ± 0.02).
- PER values refer to one PM-PS connector only. For patchcords, PER values may be slightly lower.
- Performances based upon E-2000™ optical interfaces; other mechanical interfaces may lead to slightly different results. Please contact Diamond for details.
- Diamond performs PER measurements according to the crossed-polarizer method (similar to IEC 61300-3-40) that relies upon high-extinction Glan-Thomson polarizers and incoherent light sources (bandwidth $> 10 \text{ nm}$).
- For any other requirement, please contact Diamond.



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Specifications subject to change without notice

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The PM-PS optical interface comprises

- ▶ 0.1dB Grade ferrules with diameter tolerance < 0.2µm
- ▶ Active Core Alignment (ACA) with low exit angle < 0.15°
- ▶ Increased Mode field Diameter * ~35µm
- ▶ Active Polarization Orientation (APO) < ±2°
- ▶ Ultra polish with 100% Endface inspection for PC and 4° APC

* May vary with fiber type

AVAILABLE CONNECTOR INTERFACE

DIAMOND's technology is applied to all connector interfaces with an integrated mechanical keying feature. We offer both fiber pigtailed and patchcords with:

- ▶ E-2000™
- ▶ DMI
- ▶ Mini-AVIM

QUALITY & STANDARDS

Products quality is guaranteed in compliance with international standards defining PM fibers and connectors. These include the IEC 61755-3-7/8 standards (PC, resp. APC 2.5 mm and 1.25 mm composite ZrO₂ with Titanium ferrules) dedicated to standard single-mode fibers at conventional telecom wavelengths (1310/1550 nm bands).

SAFETY INFORMATION FOR POWER SOLUTION CONNECTORS

The Power Solution (PS) connector takes advantage of the expanded beam technology to reduce the density of the optical power at the interface of the connection. This way the connector is less sensitive to contamination, and the maximum power that can be transmitted without damage to the connector is greater.

CLEANING

Cleanliness still remains the key word using high power. The basic concept using PS connectors is therefore the following: "before each mating procedure, the connectors must be absolutely clean and inspected with a microscope". The ferrule's surface inspection should be performed using an optical microscope with a magnification of at least 200x. The connector is normally affected by contamination during handling and mating procedures; the degree of cleanliness of the overall installation is also a critical parameter to be taken into consideration.

HANDLING

The Power Solution connectors should be operated with high power only when connected. When unmated, the light source must absolutely be switched off.

SAFETY

Optical connectors are passive components not subjected to Laser safety, but when integrated in an active system, as the output side of a light source, they will be submitted to it.

The following aspects are to be taken into account when evaluating the laser safety requirements:

- The exit beam of these connectors have a lower NA as standard connectors in air (NA=0.035) or ca. 2° divergence. This is used in the calculation of the amount of light that can enter the pupil at 1m.

- The DMI connector does not have a protection cap, and Diamond recommend to put a protection tap on top with the indication of the laser class according to IEC 60825-1.

The following safety precautions are to be considered as a starting point, each is responsible to edict proper safety protocols and we intend here just as to help doing this. The following precautions should not be considered as sufficient and should be re-evaluated from case to case.

- Usage in restricted area, access only for authorized and qualified personnel.
- Use protective glasses, skin protective measures recommended.
- Optical behavior under control: eliminate reflections (also diffuse), close unused optical channels, avoid light beams at eye level.
- Switch on/off system with remote control or interlock and additional automatic switch off safety system.
- Warning signal when sources are active.
- Laser classification markings and danger indications.

The PC 0° version has been provided to the market in order to help interlock system based on laser integrated RL measurement system that can discriminate the contact – non-contact PC version (large difference) whereas the APC 4° is not easily detectable (small difference).

ORDER INFORMATION

To order your connectors using PM-PS technology, please specify:

- ▶ Connector type (E-2000™ PM-PS, DMI PM-PS), wavelength and end-face (PC or APC). Example: DMI PM-PS 1550 PC or E-2000™ PM-PS 980 APC
- ▶ Fiber characteristics: MFD, NA, fiber type, coating structure and material, operating wavelength
- ▶ Please refer to the individual data sheets for detailed specifications on individual connector types.