

# MEMS 48 x 48 Fiber Optical Switch

(Non-Blocking, Bidirectional, Passive)

(Protected by U.S. patents 7224860, 6757101, 6577430 and pending patents)

The MEMS FIBER Optical switches establish optical signal paths passively in milliseconds supporting all data rates, ideally suited to manage and monitor large optical networks intelligently and remotely. The flexible platform supports NxM configurations (N, M=1 to 64). The MEMS switches are reliable with longevity suited for continuous operation. The control is net-based GUI that is compatible with standard network management protocols. It can be made to fit into a 1U box if LC connectors are selected.

The order table includes a list of standard control interfaces. Additionally, we provide a list of commands to assist customer engineers in coding. For those who require it, we offer a code-writing service for customer interfaces at an additional charge.



5-year manufacturer warranty

## Features

- Low Cost
- High Reliability
- Low Insertion Loss
- Broad Band
- Compact Design
- Low Voltage

## Applications

- Optical Signal Routing
- Network Protection
- Wavelength Management
- Signal Monitoring
- Instrumentation

## Specifications [1]

Parameters	Min	Typical	Max	Unit
Center Wavelength		1270~1630		nm
Wavelength Bandwidth			± 30	nm
Insertion Loss [1] (SM)		3	3.3	dB
Dynamic Cross Talk	45			dB
Static Cross Talk	50			dB
Extinction Ratio (PM Fiber)	18		23	dB
Switch Speed (Rise, Fall) [2]		10	20	ms
Durability	10 <sup>9</sup>			cycle
Polarization Dependent Loss		0.04	0.2	dB
Wavelength Dependence Loss [3]		0.1	0.3	dB
Return Loss	50 [7]			dB
Repeatability		0.05	0.1	dB
Operating Temperature [4]	-5		65	°C
Port to Port Time Delay Difference			0.2	ns
Optical Power Handling (CW) [5]		300	500	mW
Storage Temperature	-40		85	°C
Electrical Power Consumption			10 [6]	W
Package Dimension	2RU/4RU			

[1]. Measured without connectors for SM only, each connector adds 0.2-0.3dB

[2]. This is for a switch component. The remote control adds substantial delay (Ethernet is the longest)

[3]. Within 50nm bandwidth

[4]. -25°C~75°C version is also available.

[5]. High power version available

[6]. For the non-latching version

[7]. For SM fiber, MM fiber is 35dB

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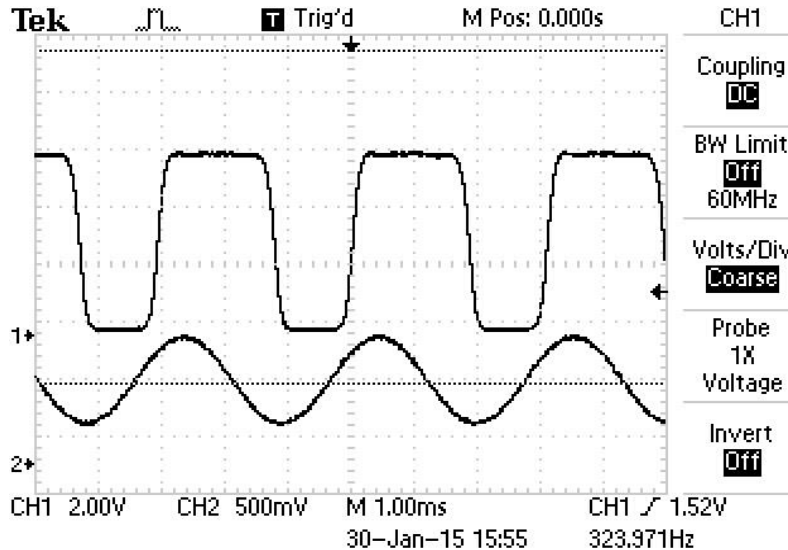
## Mechanical Dimension

19-inch rack with 2U or 4U depending on the connector type

\*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

## 10<sup>9</sup> Switching Cycle Test (This was performed on 1x2 component, not the switch system)

We have tested MEMS 1x2 switch at the resonant frequency ~300Hz for more than 40 days, as shown in the attachment, which corresponds over 10<sup>9</sup> switching cycles. The measurements show little changes in Insertion loss, Cross Talk, Return loss, etc, all parameters are within our specs.



## Control & Electric Interface

The switch default control is Ethernet with a GUI.

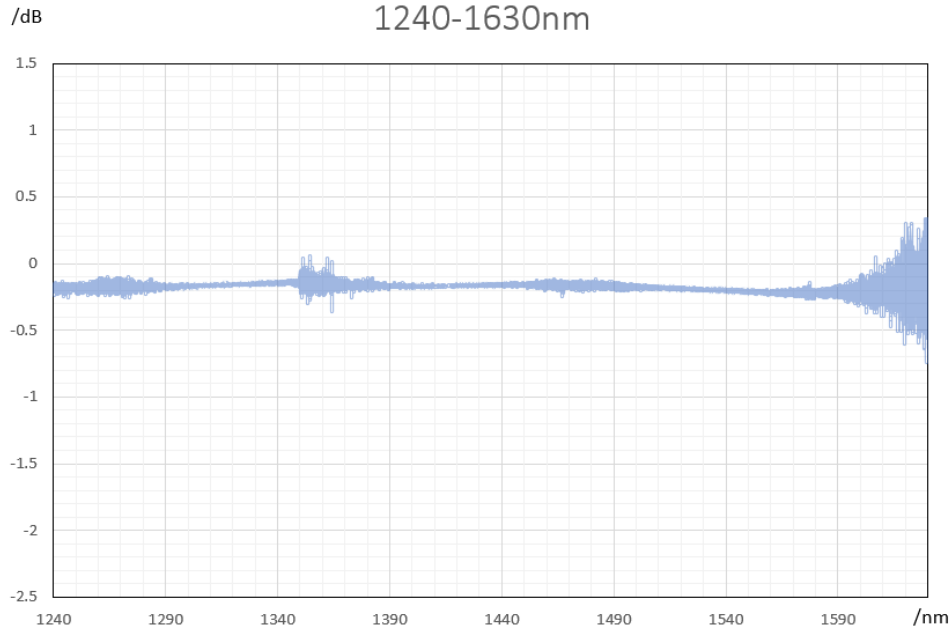
- Physical Layer: 10/100Base-T
- Data Link Layer: Ethernet Protocol per IEEE 802.3
- Network Layer: IPv4
- Transport Layer: UDP
- Application Protocol: SNMP
- Connector Type: RJ-45
- Dual 48V / 110-220V Power Input

We provide a command list for customers to write their control code, such as Python

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## Typical Insertion Loss vs Wavelength (1240-1630nm)



## Ordering Information

Prefix	Type	Wavelength <sup>[1]</sup>	Control Interface	Package	Fiber Type	Power Supply	Connector
MEMS-	A48	1240-1640nm = 1 1310 = 3 1410 = 4 1550 = 5 1310/1550 = 2 850 = 8 Special = 0	Ethernet = 2 Special = 0	2RU = 2 4RU = 4 Special = 0	SMF-28 = 1 MM 50/125 = 2 Panda <sup>[2]</sup> = 5 Special = 0	110-220V = 4 48V = 5	None = 1 FC/PC = 2 FC/APC = 3 SC/PC = 4 SC/APC = 5 ST/PC = 6 LC/PC = 7 Duplex LC/PC = 8 Special = 0

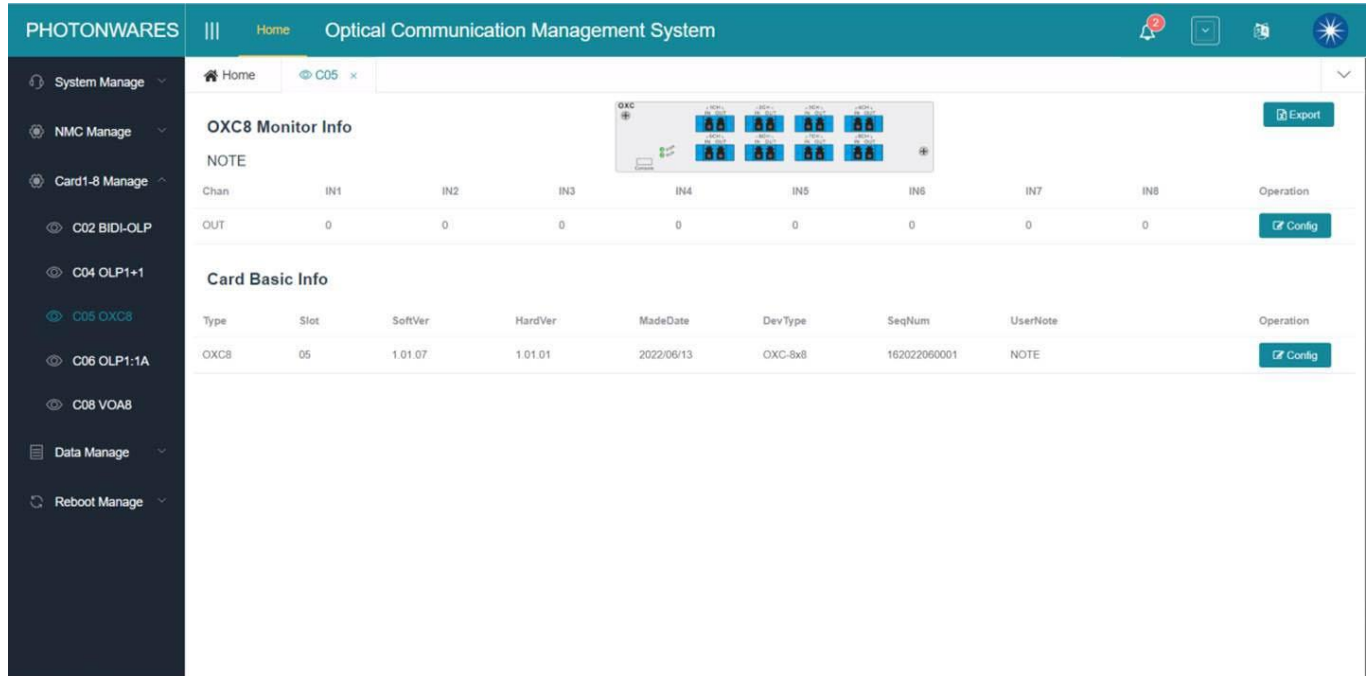
[1]. Measured wavelength. The device has a wider wavelength coverage. Customer can request to measure at several wavelengths.

[2]. For PM fiber version, please call us to get more information.

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## Example of Ethernet Remote Control GUI



The screenshot displays the Photonwares Optical Communication Management System interface. The left sidebar contains navigation options: System Manage, NMC Manage, Card1-8 Manage, C02 BIDI-OLP, C04 OLP1+1, C05 OXC8, C06 OLP1:1A, C08 VOA8, Data Manage, and Reboot Manage. The main content area shows the OXC8 Monitor Info section with a NOTE and a table of channel data. Below this is the Card Basic Info section with a table of card details.

Chan	IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8	Operation
OUT	0	0	0	0	0	0	0	0	Config

Type	Slot	SoftVer	HardVer	MadeDate	DevType	SeqNum	UserNote	Operation
OXC8	05	1.01.07	1.01.01	2022/06/13	OXC-8x8	162022060001	NOTE	Config

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## Questions and Answers

**Q:** If the device were to fail, would the switch continue to pass the fiber light through the switch as configured before failure?

**A:** This depends, if one mirror fails, it only affects the light going through that mirror.

**Q:** When power is restored, does the IN/OUT configuration before failure remain in place?

**A:** Yes, when power back up it will go to the previous flightpath

**Q:** If the power to the device were shut off, would the device continue to pass the fiber light as configured before failure?

**A:** This function is called latching. We uniquely offer MEMS latching switches but cost more.

**Q:** With the Ethernet Control Option, does the switch support SNMPv3

**A:** Yes. This internet standard protocol allows user to write their own control code

**Q:** With the Ethernet Control Option, what type of encryption does the SNMPv3 use?

**A:** MD5/DES

**Q:** With the Ethernet Control Option, could this device be controlled by multiple users at different locations and all users will also see the configuration updates?

**A:** Yes

**Q:** With the Ethernet Control Option, does the user need to install any software on their computer other than a web browser?

**A:** No

## Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1M laser product. This device has been classified with the FDA/CDRH under accession number 0220191. All versions of this laser are Class 1M laser products, tested according to IEC 60825-1:2007 / EN 60825-1:2007. An additional warning for Class 1M laser products. For diverging beams, this warning shall state that viewing the laser output with certain optical instruments (for example eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. For collimated beams, this warning shall state that viewing the laser output with certain instruments designed for use at a distance (for example telescopes and binoculars) may pose an eye hazard.

Wavelength = 1.3/1.5  $\mu$ m.

Maximum power = 30 mW.



\*Caution - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

\*IEC is a registered trademark of the International Electrotechnical Commission.