MEMS 128 x 128 Fiber Optical Switch

(Non-Blocking, Bidirectional, Passive, 70dB on/off)

(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 128). The MEMS switches are reliable and have longevity suited for continuous operation. The control is a 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.

To minimize the delay between issuing a switching command and the actuation of switches caused by a standard window-based computer, it's essential to use a dedicated computer with a real-time operating system, such as a single-board computer running real-time Linux.

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
Operation Wavelength	750		2400	nm
Insertion Loss [1] (SM)		3.5	4.5	dB
Crosstalk, On/Off Ratio	45		70	dB
Extinction Ratio (PM Fiber)	18		23	dB
Switching Speed (Rise, Fall) [2]		10	35	ms
Durability	10^9			cycle
Polarization Dependent Loss		0.3	0.5	dB
Wavelength Dependence Loss [3]		0.6	0.8	dB
Return Loss	45 [7]	50	55	dB
Repeatability		0.05	0.1	dB
Operating Temperature [4]	-5		55	°C
Port to Port Time Delay Difference			0.2	ns
Optical Power Handling (CW) [5]		300	400	mW
Storage Temperature	-40		85	°C
Electrical Power Consumption			30 [6]	W
Package Dimension (connector dependent)	4RU/6RU			

Notes:

[1]. Measured at 1550nm without connectors, each connector adds 0.2-0.3dB. Shorter or longer wavelength loss increases.
Minimum loss version is available as special order

[2]. This is intrinsic switch component performance. The remote control adds 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

Note: The specifications provided are for general applications with a cost-effective approach. If you need to narrow or expand the tolerance, coverage, limit, or qualifications, please [click this link]:

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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.

10⁹ 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 10^9 switching cycles. The measurements show little changes in Insertion loss, Cross Talk, Return loss, etc, all parameters are within our specs.
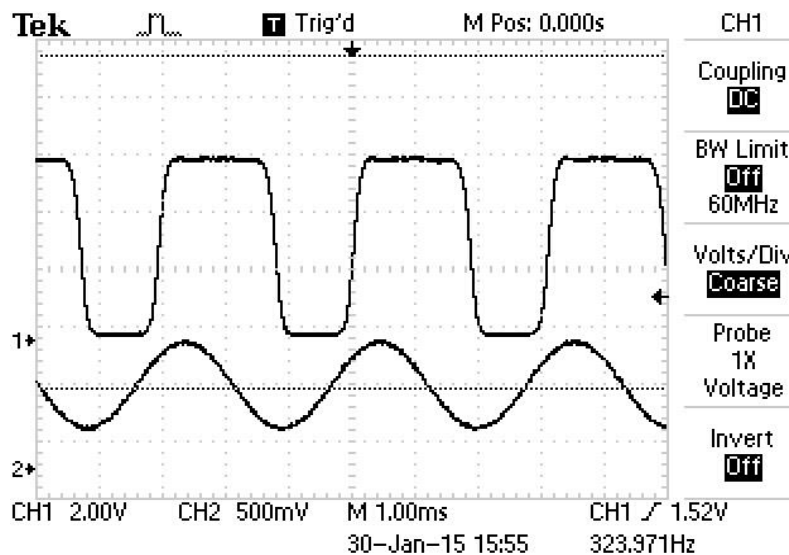
Control & Electric Interface

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)
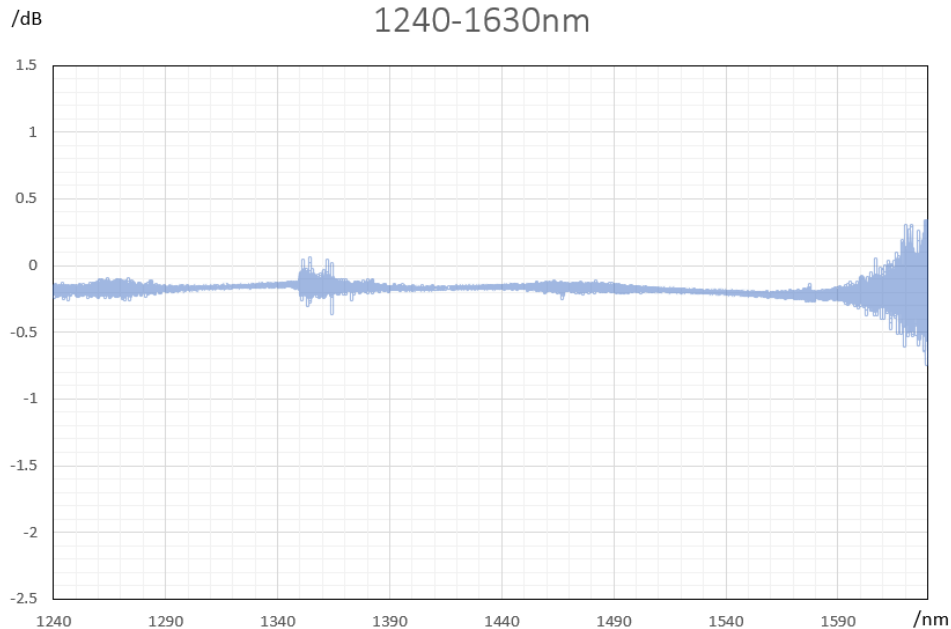
Ordering Information

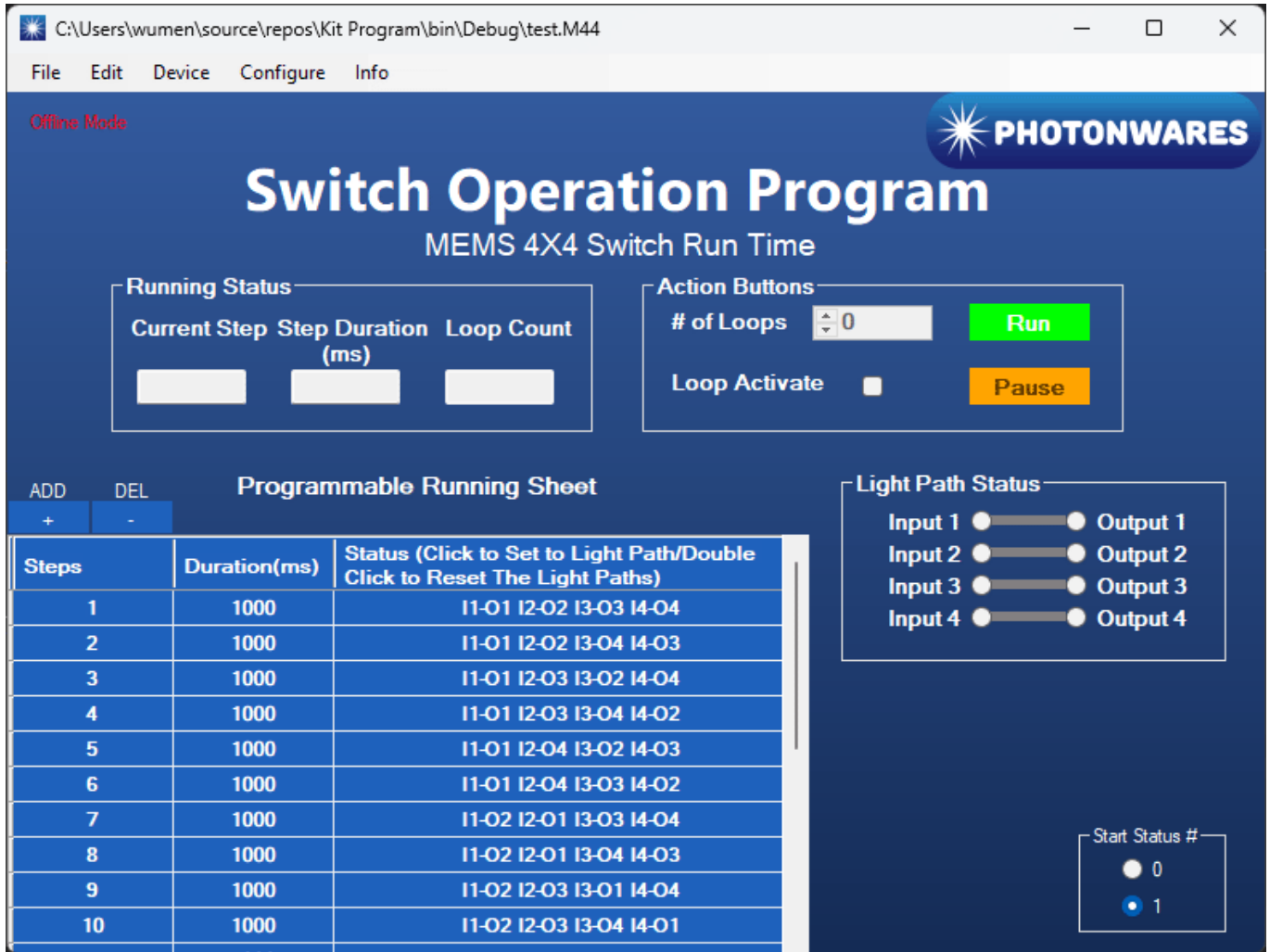| Prefix	Type	Wavelength [1]	Control Interface	Package	Fiber Type	Power Supply	Connector	On/Off	ER	Monitor
	128	☐	☐	☐	☐	☐	☐	☐	☐	☐
MEMS-		1240-1640nm = 1 1060 = 6 1310 = 3 1410 = 4 1550 = 5 1310/1550 = 2 850 = 8 Special = 0	Ethernet = 2 RS232 = 3 Special = 0	2RU = 2 4RU = 4 Special = 0	SMF-28 = 1 MM 50/125 = 2 Panda [2] = 5 62.5/125 = 6 Hi1060 = 3 Hi780 = 8 PM980 = 9 SM800 = A PM850 = B PM780 = C 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 LC/APC = A LC/UPC = U Special = 0	Regular = 1 SM70dB = 2 MM50dB = 3	Non = N >18 = 1 23 = 2 29 = 3	Non = 1 Output = 2 Input Output = 3 Input = 4

[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 RS232 Control GUI
(one can create a running receipt, pause, repeat loop)

C:\Users\wumen\source\repos\Kit Program\bin\Debug\test.M44

File   Edit   Device   Configure   Info

Offline Mode

PHOTONWARES

Switch Operation Program
MEMS 4X4 Switch Run Time
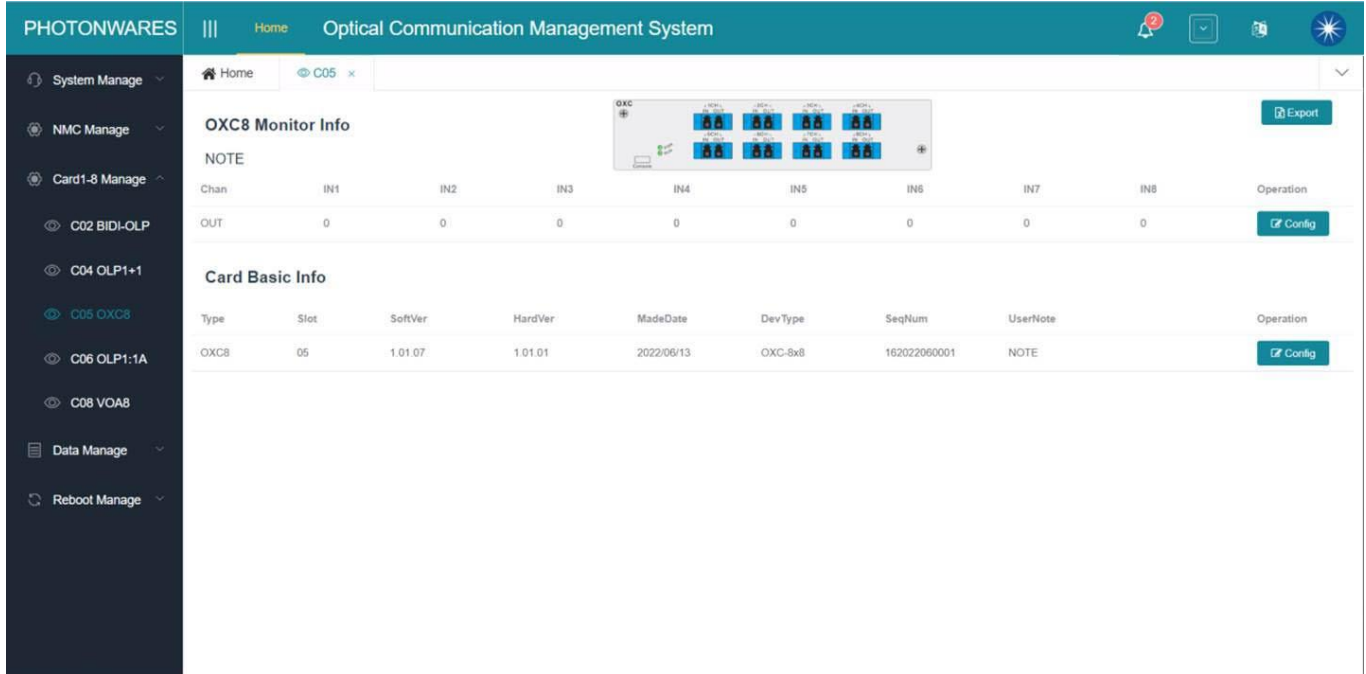
Running Status

Current Step	Step Duration (ms)	Loop Count

Action Buttons

# of Loops   0   **Run**

Loop Activate ☐   **Pause**

Programmable Running Sheet

ADD   DEL
+   -

Steps	Duration(ms)	Status (Click to Set to Light Path/Double Click to Reset The Light Paths)
1	1000	I1-O1 I2-O2 I3-O3 I4-O4
2	1000	I1-O1 I2-O2 I3-O4 I4-O3
3	1000	I1-O1 I2-O3 I3-O2 I4-O4
4	1000	I1-O1 I2-O3 I3-O4 I4-O2
5	1000	I1-O1 I2-O4 I3-O2 I4-O3
6	1000	I1-O1 I2-O4 I3-O3 I4-O2
7	1000	I1-O2 I2-O1 I3-O3 I4-O4
8	1000	I1-O2 I2-O1 I3-O4 I4-O3
9	1000	I1-O2 I2-O3 I3-O1 I4-O4
10	1000	I1-O2 I2-O3 I3-O4 I4-O1

Light Path Status

Input 1 ●━━━━● Output 1
Input 2 ●━━━━● Output 2
Input 3 ●━━━━● Output 3
Input 4 ●━━━━● Output 4

Start Status #
○ 0
◉ 1

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Example of Ethernet Remote Control GUI

PHOTONWARES ||| Home   Optical Communication Management System

- System Manage
- NMC Manage
- Card1-8 Manage
  - C02 BIDI-OLP
  - C04 OLP1+1
  - C05 OXC8
  - C06 OLP1:1A
  - C08 VOA8
- Data Manage
- Reboot Manage

🏠 Home   👁 C05 ✕

OXC8 Monitor Info

NOTE

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

Card Basic Info

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

Export

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