MEMS 6x6, 7x7, 8x8 Fiber Optical Switch

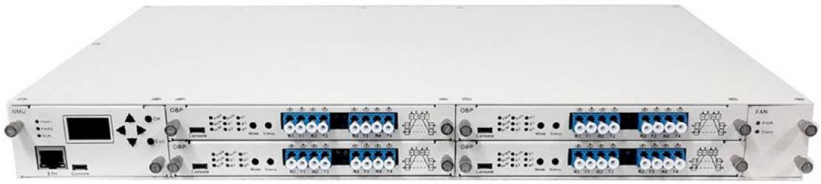
(Non-Blocking, Bidirectional, Passive, 65dB on/off, 850nm, 1260-1620nm)

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

MEMS Series Fiber Optical Switches are plug-and-play, all-in-one units that provide direct, non-blocking optical signal routing between any input ports to any output ports with millisecond switching speeds. These passive devices preserve signal integrity, supporting all data rates and waveforms. Engineered for long-term reliability, they are rated for continuous operation and backed by a five-year warranty. The standard version is optimized for lasers with linewidths greater than 1 GHz; optional specialized coatings are available to mitigate etalon effects for narrow-linewidth lasers. Each switch is housed in a rack-mounted enclosure, with height determined by the selected front panel connectors. A web-based GUI is included, compatible with standard network management protocols. For developers, a complete command set is provided, and code-writing services are available upon request. The GUI supports time-based step scripts, enabling pre-stored switching sequences to eliminate execution latency — particularly useful in automated test setups. To further minimize control delays caused by non-real-time systems, a dedicated computer running a real-time OS (e.g., Linux on a single-board computer) is recommended. A multicast version is also available for applications requiring simultaneous distribution from one input to multiple outputs.

Each switch driver includes a GUI for programming and a command set (API) so customers can develop their own control software. Python and LabVIEW interface libraries; integration support is available for a fee.

Due to inherent computer delays under Windows, response speed can be improved by using a Linux-based controller or executing stored switching sequences directly on the board. In this mode, the host computer simply issues start, pause, and repeat commands.



5-year manufacturer warranty

Features

- Low Cost
- High Reliability
- Low Insertion Loss
- Broad Band
- Bidirectional
- 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	1270~1630	2400	nm
Insertion Loss [1] (SM)		1.3	1.7	dB
Insertion Loss [1] (MM)		1.6	2.6	dB
Crosstalk, On/Off Ratio	45		65	dB
Extinction Ratio (PM Fiber)	18		23	dB
Switch Speed (Rise, Fall) [2]		5	20	ms
Durability	10^9			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
Transit Time Delay			0.2	Ms
Port to Port Time Delay Difference			0.5	Ns
Optical Power Handling (CW) [5]		300	500	mW
Storage Temperature	-40		85	°C
Electrical Power Consumption			50 [6]	W
Package Dimension	1RU/2RU/4RU			

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]:

Rev 08/13/26

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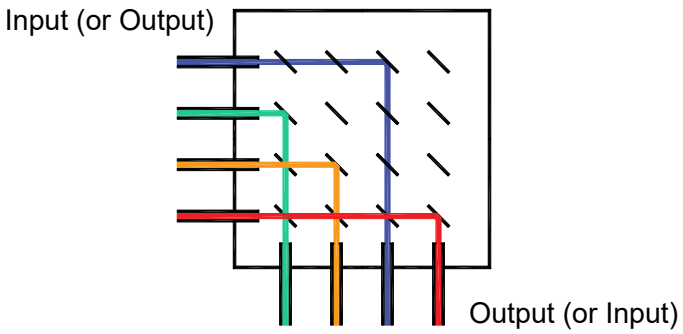
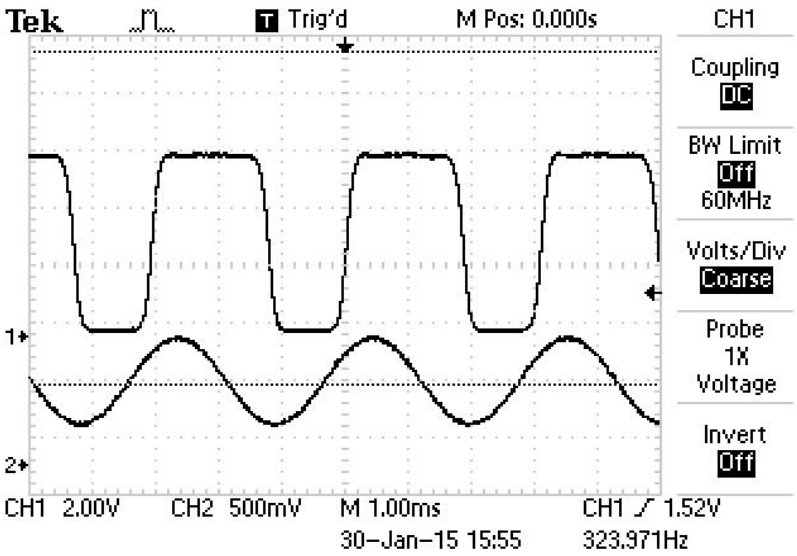
Optical Path Illustration

MEMS 4x4 Switch



10^9 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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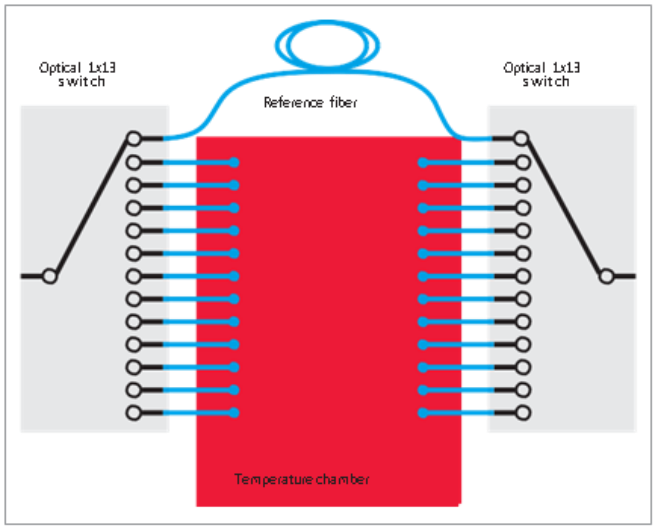
Parallel Testing Configuration

In many cases, valuable signal source and analysis instrumentation can be used more effectively in a parallel-test configuration. For example, multiple cables or components can be tested together during temperature cycling. On the other hand, an increasing use of inherently parallel components, as for optical interconnections for 40G or 100G using 10 Gb/s components, calls for identical testing in multiple paths. These are well supported by the 1x13 switch configuration and the 13th path can often be used as a permanent reference path.



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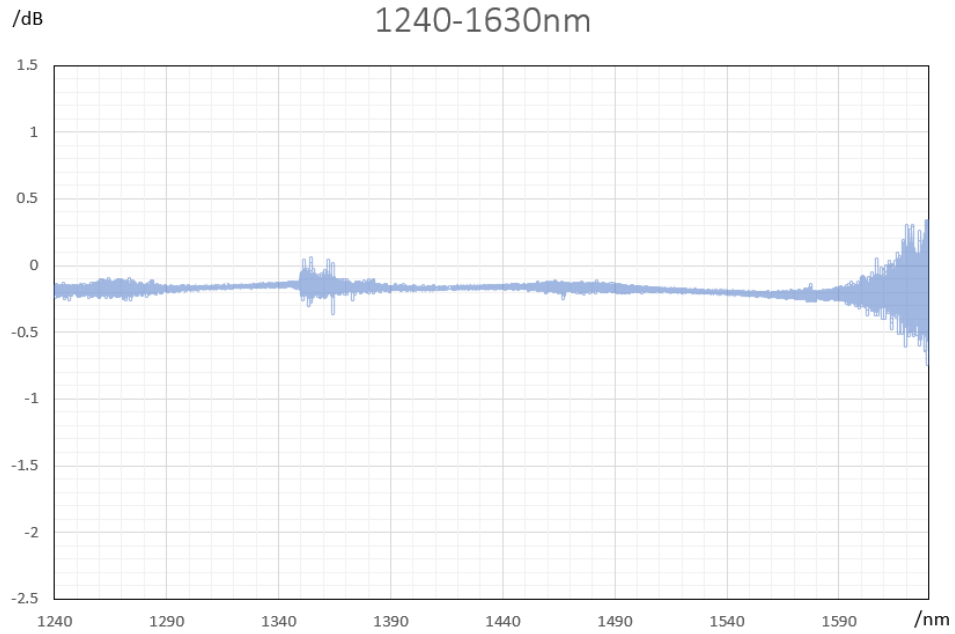
Typical Insertion Loss vs Wavelength (1240-1630nm)



Ordering Information (Part Number)

	☐☐☐☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Prefix	**Configuration**	**Channel**	**Wavelength [1]**	**Control Interface**	**Package [2]**	**Fiber Type**	**Power Supply**	**Connector [3][5]**	**On/Off**	**PER**	**Monitor**	**Interface Code [4]**
MEMS-	6x6 = 0606 7x7 = 0707 8x8 = 0808 Special = 0000 NxM = NM	Single = 1 Duplex = 2	1240-1640nm = 1 1060 = 6 1310 = 3 1410 = 4 1550 = 5 1310/1550 = 2 2000nm = A 850nm = 8 750nm = 7 Special = 0	Ethernet = 2 RS232 = 3 Special = 0	1RU = 1 1.5U = 5 2RU = 2 4RU = 4 Special = 0	SMF-28 = 1 MM 50/125 = 2 Hi1060 = 3 PM1550 = 5 62.5/125 = 6 105/125 = E 780HP = 8 PM980 = 9 SM800 = A PM850 = B PM780 = C SM1950 = L PM1950 = M Special = 0	110-220V = 4 48V = 5	None = 1 FC/PC = 2 FC/APC = 3 SC/PC = 4 SC/APC = 5 LC/PC = 7 Duplex LC/PC = 8 LC/APC = A LC/UPC = U E2000/APC = E MPO = Y Special = 0	Regular = 1 SM65dB = 2 MM50dB = 3 PM65dB = 5	Non = N >18 = 1 23 = 2 29 = 3	Non = 1 Output = 2 Input Output = 3 Input = 4	Non = N Python = P LabVIEW = L

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

[2]. Rack Mount Depth ~ 430mm.

[3]. Regular fiber connector has PER ~22dB. Connector with PER >27 dB is available using special process

[4]. GUI and a command set (API) are included. Python $**560**. LabVIEW interface libraries $**750**

[5]. The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer may remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SMF-28 fiber and decreases further for smaller-core fibers.

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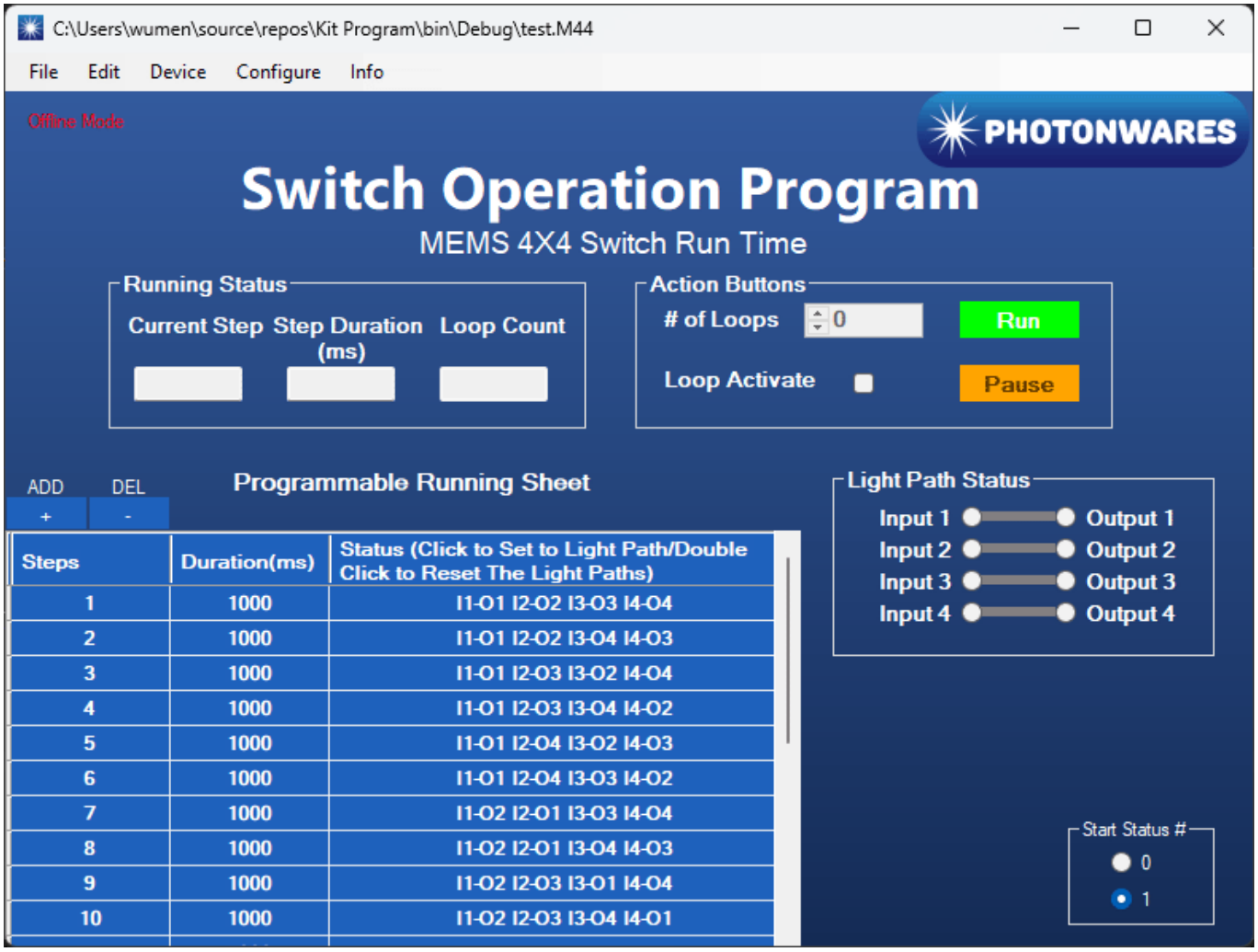
Example of RS232 Control GUI
(one can create a running receipt, pause, repeat loop)



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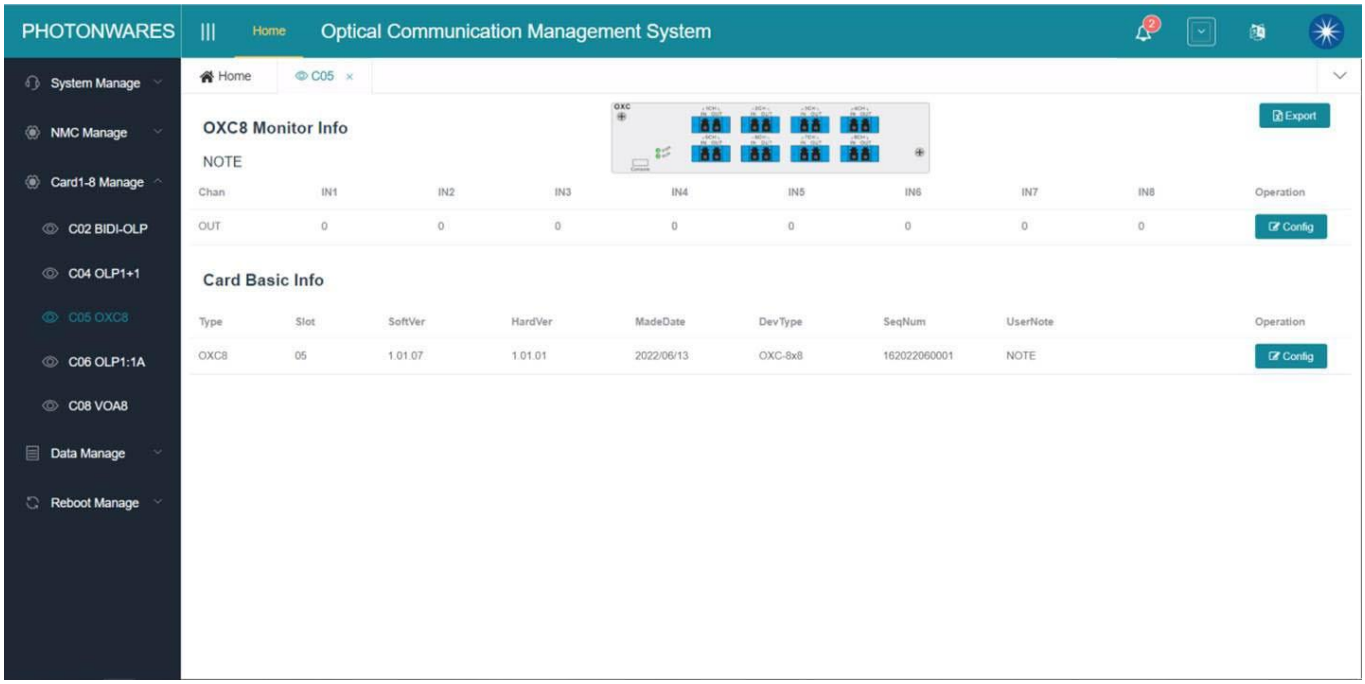
Example of Ethernet Remote Control GUI



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Ethernet Remote Control with Python

Several options: Telnet, HTTP/JSON API, or VISA Raw Socket mode (SCPI over TCP/IP)

```
############################################################
Telnet:

import telnetlib

HOST = "192.168.0.1"
PORT = 23

#####################
username = "admin"
password="admin"
###################
tn=telnetlib.Telnet(HOST,PORT)

reply=tn.read_until(b"username:",timeout=10)
print(reply.decode("ascii"))#debug
tn.write(username.encode("ascii")+b"\r\n")

reply=tn.read_until(b"password:",timeout=10)
print(reply.decode("ascii"))#debug
tn.write(password.encode("ascii")+b"\r\n")

reply=tn.read_until(b"telnet>",timeout=10)
print(reply.decode("ascii"))#debug

tn.write(b"setswitch 31 32 0 0\r\n")
reply=tn.read_until(b"telnet>",timeout=10)
print(reply.decode("ascii"))#debug

tn.write(b"runswitch\r\n")
reply=tn.read_until(b"telnet>",timeout=10)
print(reply.decode("ascii"))#debug

tn.write(b"quit\r\n")

############################################################
```


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Ethernet Remote Control with Python (ending)

Several options: Telnet, HTTP/JSON API, or VISA Raw Socket mode (SCPI over TCP/IP)

```
############################################################
API:
import requests

BASE_URL = "
TOKEN = "TOKEN"
def api_post(path, payload):
    r = requests.post(
        BASE_URL + path,
        json=payload,
        headers={"X-Auth-Token": TOKEN},
        timeout=3,
    )
    r.raise_for_status()
    return r.json()

def api_get(path):
    r = requests.get(
        BASE_URL + path,
        headers={"X-Auth-Token": TOKEN},
        timeout=3,
    )
    r.raise_for_status()
    return r.json()

# Set port 3
print(api_post("/api/set_permanent_port", {"port": 3}))
# Read status
print(api_get("/api/status"))

############################################################
pyVISA:
import pyvisa

HOST = "192.168.0.1"
TOKEN = "TOKEN"

rm = pyvisa.ResourceManager()

inst = rm.open_resource(f"TCPIP0::{HOST}::5025::SOCKET")
inst.read_termination = "\n"
inst.write_termination = "\n"
inst.timeout = 2000  # ms

print("IDN:", inst.query("*IDN?").strip())

# Set port
inst.write("SWITCH:PERMANENTPORT 3")
print("PORT?:", inst.query("SWITCH:PERMANENTPORT?").strip())

# Status
print("STATUS:", inst.query("SWITCH:STATUS?").strip())

############################################################
```


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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

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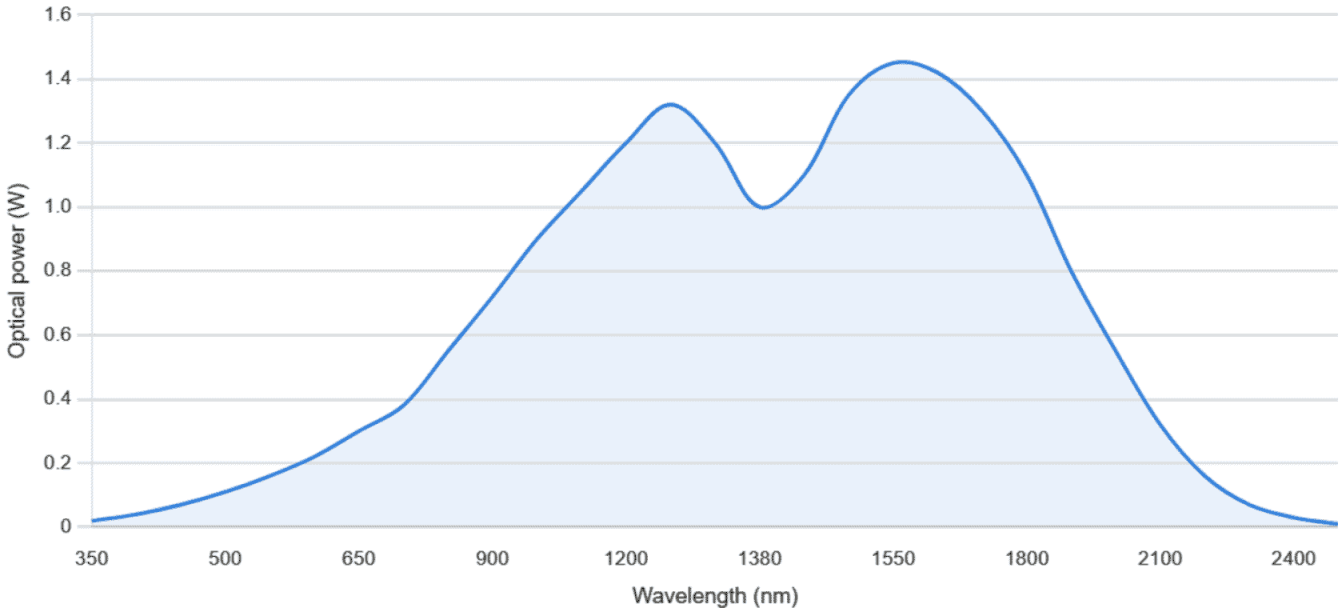
Regular Single Mode / Polarization Maintaining Fiber Optical Power Handing vs Wavelength



Single mode fiber optical power is limited by nonlinear effects in addition to absorption that increase loss and generate heat. The curve shows the approximate safe CW power envelope for standard single-mode fiber. Actual limits depend on fiber design, core size, length, and laser characteristics. Specialty fibers can significantly increase the power limit.

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