SMI-1000 Gigabit Media Converters

1000Base-T to 1000Base-X Fiber Mode Conversion

- 1000Base-T to 1000Base-X Fiber Media Converters
- Extend network distances up to 160km
- Manage via SNMP, CLI - Telnet/SSH, Internet Browser, or PerleVIEW Centralized Management Package
- Advanced media converter features - Smart Link Pass-Through, Fiber Fault Alert, Auto-MDIX and Loopback

Perle's advanced line of **Managed Gigabit Media Converters**, provides transparent and reliable **Gigabit Ethernet to fiber connections**. While providing an economical means of extending your existing copper based network connection, these media converters are SNMP manageable to enable complete control and status viewing of your fiber links.

Perle Gigabit Managed Media Converters come standard with extensive cost and time saving features. In addition, a lifetime warranty and free worldwide technical support make Perle's Managed Gigabit to Fiber Converters the smart choice for IT professionals.

SMI-1000 Managed Gigabit Media Converter Features

Configuration Mode selection	Select whether to use the on-board DIP switches or the management software for mode selection
Converter Information	- User configurable converter name - User configurable fiber port name - User configurable copper port name - Hardware revision number - Firmware version number
DIP switch settings	View hardware DIP switch settings
Low power mode	If enabled it sets the Gigabit copper transceiver into "low power mode" which limits the strength of the signal. (for shorter cable lengths). Default is disabled
Port Control	Enable or disable individual fiber or copper port on the converter

Copper Port Status	• Port Enabled (Yes/No) • Link Status (Up/Down) • Auto Negotiation Settings (Disabled, Complete or In Progress) • Resolved as crossover MDI or MDIX type
Fiber Port Status	• Port Enabled (Yes/No) • Connector type (SC, LC, ST, SFP) • Link Status (Up/Down) • Far End Fault (OK, Failed) • Fiber Loopback mode (On/Off)
Control	• Reset • Reset to factory default • Ability to specific read/write phy registers • Update firmware • Fiber Loopback mode (Yes/No) • Upload/download configuration
Auto-Negotiation (802.3ab)	The media converter supports auto negotiation. The 1000Base-X fiber interface negotiates according to 802.3 clause 37. The 1000Base-T negotiates according to 802.3 clause 28 and 40. The 1000Base-X will link up with its partner after the highest common denominator (HCD) is reached and the copper has linked up with its partner. The 1000Base-X will continue to cycle through negotiation transmitting a remote fault of offline (provided this is enabled through the switch setting) until the copper is linked up and the HCDs match. The media converter supports auto-negotiation of full duplex, half duplex, remote fault, full duplex pause, asymmetric pause and Auto MDI-X.
Auto-MDIX with Skew Correction	Auto-MDIX (automatic medium-dependant interface crossover) detects the signaling on the 1000Base-T interface to determine the type of cable connected (straight-through or crossover) and automatically configures the connection when enabled. The media converter can also correct for wires swapped within a pair. The media converter will adjust for up to 64ns of delay skew between the 1000Base-T pairs.
Smart Link Pass-Through	When the Link Mode switch is placed into Smart Link Pass-Through mode, the 1000Base-T port will reflect the state of the 1000Base-X media converter port. This feature can be used whether fiber auto-negotiation is enabled or disabled.

Fiber Fault Alert	With Fiber Fault Alert the state of the 1000Base-X receiver is passed to the 1000Base-X transmitter. This provides fault notification to the partner device attached to the 1000Base-X interface of the media converter. If the 1000Base-X transmitter is off as a result of this fault it will be turned on periodically to allow the condition to clear should the partner device on the 1000Base-X be using a similar technique. This eliminates the possibility of lockouts that occur with some media converters. Applies only when fiber auto-negotiation is disabled.
Pause (IEEE 802.3x)	Pause signaling is an IEEE feature that temporarily suspends data transmission between two devices in the event that one of the devices becomes overwhelmed. The media converter supports pause negotiation on the 1000Base-T fiber connection and 1000Base-X fiber connection. Select Symmetrical, asymmetrical TX or asymmetrical RX
Duplex	Full and half duplex operation supported.
Jumbo Packets	Transparent to jumbo packets up to 10KB-default. Jumbo packet support can be disabled.
VLAN	Transparent to VLAN tagged packets. Default Jumbo packet can be disabled.
Remote Loopback	Capable of performing a loopback on the 1000Base-X fiber interface.

SMI-1000 Advanced Management Features

Enterprise and carrier-grade security is available through the support of strong authentication systems such as TACACS+, RADIUS and LDAP. Secure in-band access is assured via SNMPv3, SSH CLI and secure HTTPS Internet browser.

SNMP	- Full read/write capabilities via central SNMP servers and PerleVIEW - Send SNMP traps (up to 4 servers) - SNMPv3, V2C and V1 - SNMPv3 – encryption and authentication for both management and trap support - RFC1213 MIB II - Proprietary MIB provided
Telnet / SSH CLI access	In-band command line access via Telnet or SSH application
Internet Browser access	- Fast and intuitive graphical web interface for use with common internet browsers such Internet Explorer, Mozilla Firefox and Safari - HTTP or secure HTTPS - PerleVIEW Centralized Management Package

Console port CLI access	Out-of-band command line access via Cisco compatible RJ45 serial console port using common "rolled" CAT5 cable. Console port can be enabled (default) or disabled
Concurrent management sessions	Run multiple management sessions simultaneously for multiple users
Inactivity timeout	Protect secure management sessions by setting an inactivity timeout value
Alert event reporting	Alert level events are stored in the local event log and sent as: - SNMP traps to up to 4 servers - SYSLOG messages to a SYSLOG server - Email to user defined email address
Advanced IP feature set	- IPV4 and IPV6 address support - DHCP - DNS - Dynamic DNS - NTP - TFTP - Telnet - SSH V2 and V1 - HTTP - HTTPS
Advanced Management User Authentication with primary and secondary server support	- TACACS+ - RADIUS - LDAP - Active Directory via LDAP - RSA Secure ID-agent or via RADIUS authentification - Kerberos - NIS
<u>Advanced Management User Authorization and Accounting</u>	- TACACS+ - RADIUS
Encryption	- AES (256/192/128), 3DES, DES, Blowfish, CAST128, ARCFOUR(RC4), ARCTWO(RC2) - Hashing Algorithms: MD5, SHA-1, RIPEMD160, SHA1-96, and MD5-96 - Key exchange: RSA, EDH-RSA, EDH-DSS, ADH - X.509 Certificate verification: RSA, DSA

Access Control List	An access control list can be created which can filter out only those workstations that are authorized to access the management resources. Filter on IP and/or Ethernet MAC addresses
Network Services Filter	Enable only those network services on the management module that are allowed on your network (Telnet, SSH, HTTP, HTTPS, SNMP)
Firmware download	Update the latest level firmware for management and media converter modules via TFTP or PerleVIEW

Media Converter Module Indicators

Power / TST	This green LED is turned on when power is applied to the media converter. Otherwise it is off. The LED will blink when in Loopback test mode.
Fiber link on / Receive activity (LKF)	This green LED is operational only when power is applied. The LED is on when the 1000Base-X link is on and flashes with a 50% duty cycle when data is received. The LED will slow blink when the 1000Base-X interface has been taken down as a result of a fault on the 1000Base-T interface.
Copper link on / Receive activity (LKC)	This green LED is operational only when power is applied. The LED is on when the 1000Base-T link is on and flashes with a 50% duty cycle when data is received. The LED will slow blink when the 1000Base-T interface has been taken down as a result of a fault on the 1000Base-T interface.

Management Module Indicators / reset

Power	Blinking green during startup cycle Steady green: module has power and is ready Red : error
ALM	Red alarm indicator activated when an alert event occurs
LKC	Green indicator indicating an active Ethernet link. Blinking indicates RX and TX of data
100/1000	Green - 1000 Mbps link Yellow - 100 Mbps link Off - 10 Mbps or no Link
Reset button	Recessed pinhole button resets module

Connectors

1000Base-T	RJ45 connector, 4 pair CAT5 UTP cable or better Magnetic Isolation - 1.5kv

Management ethernet port	10/100/1000Base-T - RJ45 Auto- MDI/MDIX
Management console port	RS232 Serial RJ45 - Cisco pinout for use with standard CAT5 "rolled cable" (crossover) 9600 to 115k bps 7/8 bits Odd,even, no parity 1/2 stop bits Hardware/software flow control DCD/DSR monitoring

Packet Transmission Characteristics

Bit Error Rate (BER)	$<10^{-12}$

Switches - accessible through a side opening in the chassis

Auto-Negotiation	Enabled (Default - Up) In this mode the 1000Base-X and the 1000Base-T will negotiate to the HCD of the two link partners. The 1000Base-X will link up after the negotiation is completed and the 1000Base-T has linked up. Disabled - The 1000Base-X will not use auto negotiation. The 1000Base-T will negotiate to the HCD of the Switch settings and the link partner.
Link Mode	Link Mode provides a transparency to the state of the copper link allowing for simplified trouble shooting from the devices connected to the media converter. With Fiber Auto Negotiation enabled when the 1000Base-T link goes down the 1000Base-X link is brought down. The 1000Base-X link will advertise Remote Fault (Link Fault). With Fiber Auto Negotiation disabled the state of the 1000Base-T link has no effect on the 1000Base-X link. *Smart Link Pass Through (Down)* With Fiber Auto Negotiation enabled the behavior is as follows. When the 1000Base-T link goes down the 1000Base-X link is brought down. The 1000Base-X link will advertise Remote Fault (Link Fault). When Remote Fault (Link Fault) is received on the 1000Base-X interface the 1000Base-T transmitter will be turned off. When the 1000Base-T receiver is off the 1000Base-X transmitter will be turned off. When the 1000Base-X receiver goes off the 1000Base-T transmitter will be turned off. With Fiber Auto-Negotiation disabled the behavior is as follows. When the 1000Base-T receiver is off the 1000Base-X transmitter will be turned off. When the 1000Base-X receiver goes off the 1000Base-T transmitter will be turned off.

Pause	When Fiber Auto Negotiation is disabled Pause should only be enabled when all devices connected to the media converter support pause. *Enabled(Default)* - The Media converter will advertise Pause capable, Asymmetric pause not needed during Auto-Negotiation. *Disabled* - The Media converter will advertise that it does not have Pause capability during Auto-Negotiation.
Fiber Fault Alert	The Fiber Fault Alert switch has meaning when Auto-Negotiation is disabled *Enabled (Default - Up)* When the 1000Base-X receiver is off the 1000Base-X transmitter is turned off. Periodically the 1000Base-X receiver will be turned on for a short period to allow the condition to clear if the 1000Base-X link partner is using a similar feature. *Disabled (Down)*
Duplex	*Full (Default-Up)* - The media converter will advertise Full Duplex Capable, Half Duplex Capable. *AUTO (Down)* -The media converter will advertise Full Duplex Not Capable, Half Duplex Capable.
Remote Loopback	The media converter can perform a loopback on the 1000Base-X fiber interface. *Disabled (Default - Up)* Enabled - The 1000Base-X receiver is looped to the 1000Base-X transmitter. The 1000Base-T transmitter is taken off the interface.

Power

Input Supply Voltage	(12 vDC Nominal)
Current	0.42amps at 12vdc
Power Consumption	4.98watts
Power Connector	5.5mm x 9.5mm x 2.1mm barrel socket

Power Adapter

Universal AC/DC Adapter	100-240v AC, regulated DC adapter included

Environmental Specifications

|	
Operating Temperature	0° C to 50° C (32° F to 122° F)
Storage Temperature	minimum range of -25° C to 70° C (-13° F to 158° F)
Operating Humidity	5% to 90% non-condensing
Storage Humidity	5% to 95% non-condensing
Operating Altitude	Up to 3,048 meters (10,000 feet)
Heat Output (BTU/HR)	17
MTBF (Hours)*	248,259 without power adapter 169,698 with power adapter
Chassis	Metal with an IP20 ingress protection rating

Mounting

Din Rail Kit	Optional
Wall / Rack Mount Kit	Optional

Product Weight and Dimensions

Weight	0.722 kg
Dimensions	175 x 145 x 23 mm

Packaging

Shipping Weight	1.2 kg
Shipping Dimensions	300 x 200 x 70 mm

Regulatory Approvals

Emissions	FCC Part 15 Class A, EN55022 Class A
	CISPR 22 Class A CISPR 32:2015/EN 55032:2015 (Class A) CISPR 24:2010/EN 55024:2010

	EN61000-3-2
Immunity	EN55024
Electrical Safety	UL 60950-1
	IEC 60950-1(ed 2); am1, am2 EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013
	CE
Laser Safety	EN 60825-1:2007
	Fiber optic transmitters on this device meet Class 1 Laser safety requirements per IEC-60825 FDA/CDRH standards and comply with 21CFR1040.10 and 21CFR1040.11.
Environmental	Reach, RoHS and WEEE Compliant
Other	ECCN: 5A992
	HTSUS Number: 8517.62.0050
	CCATS: G134373
	Perle Limited Lifetime Warranty

*Calculation model based on MIL-HDBK-217-FN2 @ 30 °C

Managed Ethernet to Fiber Links

Manage your copper to fiber link with a Managed Standalone Media Converter. Ideal for use in managed networks with low density fiber applications. A Managed Standalone Media Converter is connected across a fiber link to a remote media converter. The copper and fiber link on the managed standalone unit can provide vital information and status to network management tools such as SNMP.
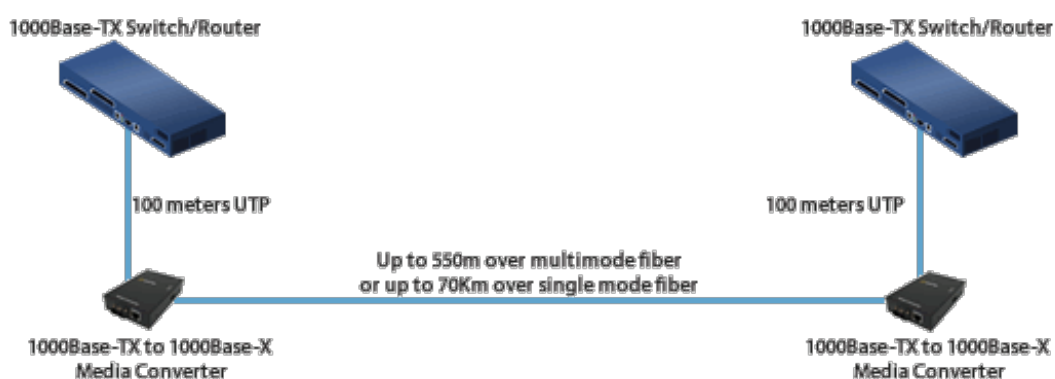
SNMP
Syslog
SMTP
SNTP

TACACS
RADIUS
LDAP
Kerberos
NIS

Telnet
SSH
HTTPS
Internet Browser
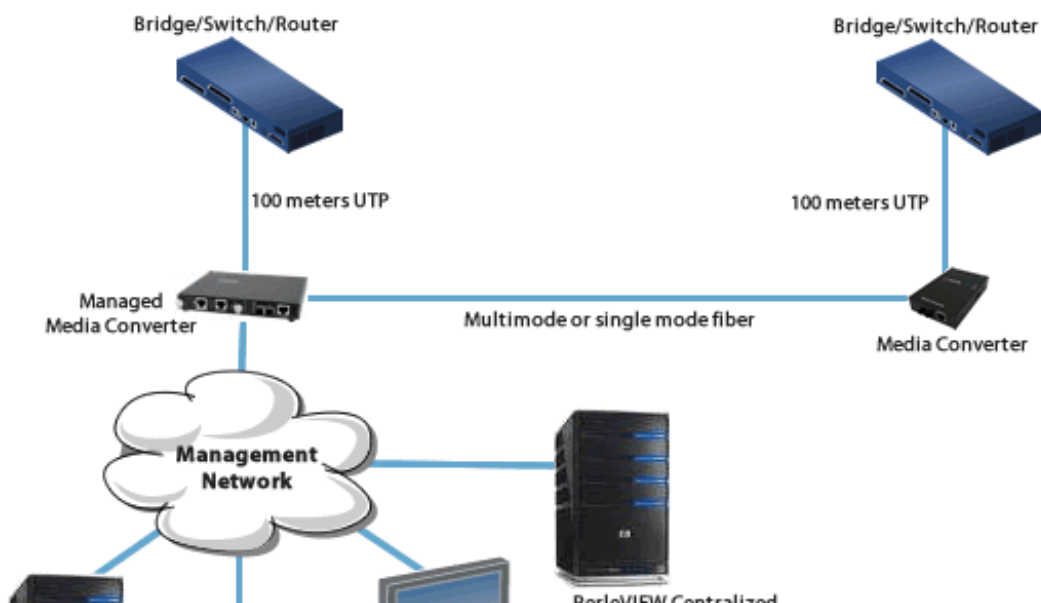
Extend between two TP Gigabit Switches

Extend the network distance between two twisted pair Gigabit Switches

Two Gigabit Ethernet Media Converters can extend the distance between 1000Base-T Switches across a fiber link up to 120Km in length.

1000Base-TX Switch/Router

1000Base-TX Switch/Router

100 meters UTP

100 meters UTP

Up to 550m over multimode fiber
or up to 70Km over single mode fiber

1000Base-TX to 1000Base-X
Media Converter

1000Base-TX to 1000Base-X
Media Converter

Switch to Gigabit Server

Extend the network distance between a Gigabit Switche and a Gigabit File Server

Two Gigabit Ethernet Media Converters can extend the distance between a 1000Base-T Switch and a Gigabit File Server across a fiber link up to 120Km in length.

1000Base-TX Switch/Router

Gigabit
File Server

100 meters UTP

100 meters UTP

Up to 550m over multimode fiber
or up to 70Km over single mode fiber

1000Base-TX to 1000Base-X
Media Converter

1000Base-TX to 1000Base-X
Media Converter

Gigabit Mode-Conditioning Adapters - More Distance

Extend Gigabit to 550m over 62.5 micron Multimode Fiber

## Extend Gigabit to 550m over 62.5 micron Multimode Fiber

Gigabit across 62.5 micron MMF cable is normally limited to 275 meters. By adding mode-conditioning adapters and 1000baseLX media converters you can extend the distance up to 550 meters on MMF cable plant.
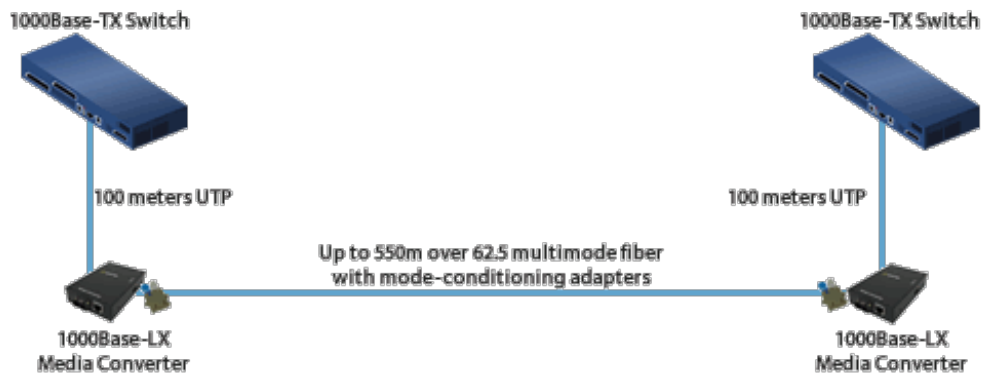
Gigabit Mode-Conditioning Adapters – 1000Base-LX

Installing Gigabit 1000Base-LX routers and switches into existing multimode cable plants

Using mode-conditioning adapters and a 1000Base-LX media converter, connect a copper based Gigabit Switch with a remote 1000base-LX switch/router over existing multimode cable plant.
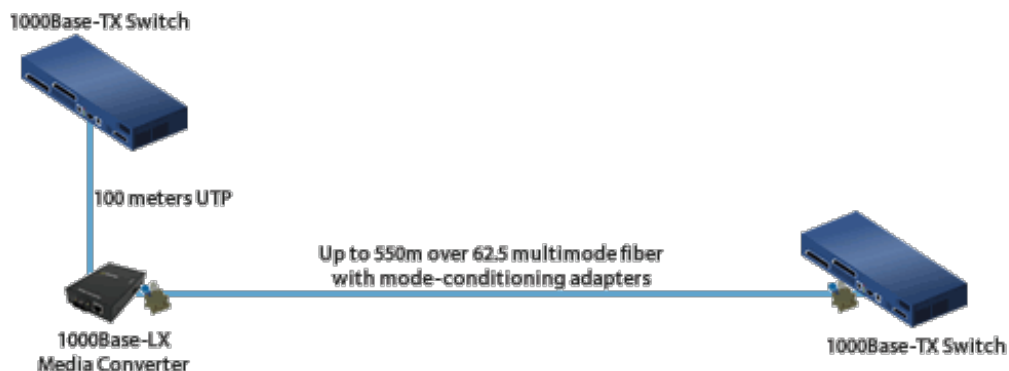
Single Mode / Single Fiber

Connect copper ports over a single fiber strand (also referred to as "Bi-Directional" BiDi)

When Single Strand fiber is used, a pair of Single Fiber Media Converters is needed for the copper to fiber conversion. Perle Single Fiber Media Converters are also referred to as "Up/Down" models. For example the SMI-1000-S1SC10**U** ("Up") and SMI-1000-S1SC10**D** ("Down"), shown below, must be used in pairs. An "**U**p" must be matched with a "**D**own" peer to deal with transmit and receive frequencies separately.
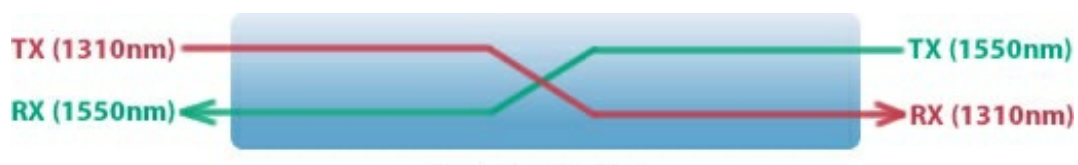
SMI-1000-S1SC10USMI-1000-S1SC10D

The majority of installations for single mode fiber media converters are of the "dual connector" or "dual fiber" type where one fiber connection is used for transmit, the other for receive. These are physically "crossed" to match up the Transmit/Receive links.

However, to reduce costs, or where there are limits on available fiber, WDM technology may be utilized. WDM uses separate transmit and receive frequencies to communicate on a single fiber strand. WDM technology relies on the fact that optical fibers can carry many wavelengths of light simultaneously without interaction between each wavelength. Thus, a single fiber can carry many separate wavelength signals or channels simultaneously.

So remember, if Single Strand fiber is used, you will need an "**Up**" Media Converter on one side and a "**Down**" Media Converter on the other for copper to fiber conversion.

Perle offers a wide variety of Single Fiber ("**U**p/**D**own") Media Converters to connect 10BaseT, Fast Ethernet and Gigabit to single fiber. Whether you need Managed or Unmanaged, Standalone or Modular Chassis Based, 20km or 120km, Perle has the right model to meet your fiber conversion requirement.

Select a Model to obtain a Part Number - Managed Stand-alone Media Converters - Gigabit Ethernet to Fiber

Model	Connector	Type	Transmit (dBm)		Receive (dBm)		Power Budget (dBm)	Wavelength (nm)
			Min	Max	Min	Max		
SMI-1000-M2SC05	Dual SC	1000Base-SX	-9.5	-4.0	-17.0	-3.0	7.5	850
SMI-1000-M2LC05	Dual LC	1000Base-SX	-9.5	-4.0	-17.0	-3.0	7.5	850

SMI-1000-M2ST05	Dual ST	1000Base-SX	-9.5	-4.0	-17.0	-3.0	7.5	850
SMI-1000-M2SC2	Dual SC	1000Base-LX	-6.0	0.0	-17.0	-0.0	11	1310
SMI-1000-M2ST2	Dual ST	1000Base-LX	-6.0	0.0	-17.0	-0.0	11	1310
SMI-1000-M2LC2	Dual LC	1000Base-LX	-9.0	-1.0	-19.0	-1.0	10	1310
SMI-1000-S2SC10	Dual SC	1000Base-LX/LH	-9.5	-3.0	-20.0	-3.0	10.5	1310
SMI-1000-	Dual LC	1000Base-LX/LH	-9.5	-3.0	-20.0	-3.0	10.5	1310

S2LC10								
SMI-1000-S2ST10	Dual ST	1000Base-LX/LH	-9.5	-3.0	-20.0	-3.0	10.5	1310
SMI-1000-S2SC40	Dual SC	1000Base-EX	-2.0	2.0	-23.0	-3.0	21.0	1310
SMI-1000-S2LC40	Dual LC	1000Base-EX	-3.0	2.0	-23.0	-3.0	20.0	1310
SMI-1000-S2ST40	Dual ST	1000Base-EX	-2.0	2.0	-23.0	-3.0	21.0	1310
SMI-1000-S2SC70	Dual SC	1000Base-ZX	-2.0	5.0	-23.0	-3.0	21.0	1550
SMI-1000-S2LC70	Dual LC	1000Base-ZX	0.0	5.0	-23.0	-3.0	23.0	1550
SMI-1000-S2ST70	Dual ST	1000Base-ZX	-2.0	5.0	-23.0	-3.0	21.0	1550
SMI-1000-S2SC120	Dual SC	1000Base-EZX	0.0	5.0	-32.0	-9	32.0	1550
SMI-1000-S2LC120	Dual LC	1000Base-EZX	0.0	5.0	-32.0	-9	32.0	1550
SMI-1000-	Dual ST	1000Base-EZX	0.0	5.0	-32.0	-9	32.0	1550

Model	Connector	Type						
S2ST120								
SMI-1000-S2SC160	Dual SC	1000Base-ZX	2.0	5.0	-34.0	-9	36	1550
SMI-1000-S2LC160	Dual LC	1000Base-ZX	2.0	5.0	-34.0	-9	36	1550
SMI-1000-S2ST160	Dual ST	1000Base-ZX	2.0	5.0	-34.0	-9	36	1550

Single Fiber Models Recommended use in pairs

Model	Connector	Type	Transmit (dBm)		Receive (dBm)		Power Budget (dBm)	Waveleng (nm)
			Min	Max	Min	Max		
SMI-1000-M1SC05U	Single SC	1000Base-BX-U	-10.0	-4.0	-17.0	-3.0	7.0	1310 / 155
SMI-1000-M1SC05D	Single SC	1000Base-BX-D	-10.0	-4.0	-17.0	-3.0	7.0	1550 / 131
SMI-1000-S1SC10U	Single SC	1000Base-BX-U	-9.0	-3.0	-20.0	-3.0	11.0	1310 / 149
SMI-1000-S1SC10D	Single SC	1000Base-BX-D	-9.0	-3.0	-20.0	-3.0	11.0	1490 / 131
SMI-1000-S1SC20U	Single SC	1000Base-BX-U	-8.0	-3.0	-22.0	-3.0	14.0	1310 / 149
SMI-1000-S1SC20D	Single SC	1000Base-BX-D	-8.0	-3.0	-22.0	-3.0	14.0	1490 / 131
SMI-1000-S1SC40U	Single SC	1000Base-BX-U	-3.0	2.0	-23.0	-3.0	20.0	1310 / 149
SMI-1000-S1SC40D	Single SC	1000Base-BX-D	-3.0	2.0	-23.0	-3.0	20.0	1490 / 131
SMI-1000-S1SC80U	Single SC	1000Base-BX-U	-2.0	3.0	-26.0	-3.0	24.0	1510 / 149
SMI-1000-	Single SC	1000Base-	-2.0	3.0	-	-3.0	24.0	1590 / 151

SMI-1000-S1SC80D	Single SC	1000Base-BX-D	-2.0	3.0	26.0	3.0	21.0	1590 / 15...
SMI-1000-S1SC120U	Single SC	1000Base-BX-U	-3.0	2.0	-34	-9	31	1510 / 159...
SMI-1000-S1SC120D	Single SC	1000Base-BX-D	-3.0	2.0	-34	-9	31	1590 / 151...

The minimum fiber cable distance for all converters listed is 2 meters.

*A mode-conditioning adapter as specified by the IEEE standard, is required regardless of the span length. Note how the mode conditioning adapter for 62.5-um fibers has a different specification from the mode-conditioning adapter for 50-um fibers.

**ITU-T G.652 SMF as specified by the IEEE 802.3z standard.

Media Converter Accessories

4 DIN Rail Mount Bkt	DIN Rail Mounting Kit
MCSM	Standalone media converter wall mount bracket