OPTICAL POWER METERS & LIGHT SOURCES

The OPM2XX, OPM5XX and SLS5XX provide the technician with a ruggedized tool set to accurately and quickly measure the insertion loss of singlemode and multimode fiber links.

The OPM2XX and OPM5XX measure the absolute fiber power to validate the optical loss budget in FTTX and P2P networks. All common wavelengths are supported and work in harmony with the dual and triple wavelength sources to facilitate insertion loss measurements. Tone injection is supported so that individual fibers can be identified when used with the OPM2XX, OPM5XX or FI-100.

The OPM2XX also incorporates an integrated visual fault locator for safe and quick visual identification of cut or damaged fiber, Macrobends and contaminated or damaged connectors.

The IP54 rating along with industry leading vibration and shock specifications assure the technician will complete their assigned task in even the most demanding environment.

Distribution in the UK & Ireland

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OPM210 / OPM220 MICRO OPTICAL POWER METER

FEATURES

- Wide measurement range (+10 to -70dBm)
- High power CATV range (+26 to -50dBm)
- VFL for safe and effective fault locating
- Singlemode and multimode compatible
- Calibrated wavelengths of 850/1300/1310/1490/1550/1625nm
- 270Hz, 1kHz and 2kHz tone detect
- Auto power off

CONTENTS:

- Micro OPM with VFL
- Lanyard
- Instruction sheet
- Certificate of Conformance

SPECIFICATIONS:

PARAMETER	SPECIFICATIONS	
Model:	OPM210	OPM220
Measurement Range:	-70 to +10dBm (1310/1490/1550/1625)	-50 to +26dBm (1310/1490/1550/1625)
	-60 to +10dBm (850/1300)	-40 to +26dBm (850/1300)
Calibrated Wavelengths:	850, 1300, 1310, 1490, 1550, 1625nm	
Display Resolution:	0.01dB	
Accuracy*:	+/-0.25dB	
Linearity*:	+/-0.5dB (+10 to -3dBm) +/-0.1dB (-3 to -50dBm) +/-0.5dB (-50 to -70dBm)	+/-0.5dB +26 to -3dBm +/-0.1dB -3 to -50dBm
Connector:	Universal 2.5mm	
Wavelength Response:	700 - 1700nm	
Detector:	InGaAs	
Power Supply:	AAA x 2 Alkaline	
Battery Lifetime:	>60 Hours (OPM mode)	
Operating Temperature:	-10 to +50°C (<90% Relative Humidity)	
Storage Temperature:	-20 to +60°C (<90% Relative Humidity)	
VFL Wavelength:	650nm +/-20nm	
VFL Output:	≤ 1mW/ 2Hz	
VFL Range:	4km	
Size:	106 x 58 x 28mm (4.17 x 2.28 x 1.10")	
Weight:	106g (0.23lbs)	
Auto Power Off:	10 minutes of no activity	
Certifications:	CE, RoHS, CDRH, WEEE	

ORDERING INFORMATION:

PART NO.	CAT. NO.	DESCRIPTION
55500025	OPM210	Standard Power OPM with VFL
55500026	OPM220	High Power OPM with VFL
52068673	125mm ADAPTER	1.25mm Adapter
52084662	08325	Micro OPM Carry Case

OPM510 / OPM520 OPTICAL POWER METER

FEATURES

- Wide measurement range (+6 to -70dBm)
- High power CATV range (+26 to -50dBm)
- Singlemode and multimode compatible
- Calibrated wavelengths of 850/1300/1310/1490/1550/1625nm
- 270Hz, 1kHz and 2kHz tone detect
- Auto power off

CONTENTS:

- Optical Power Meter
- SC Adapter
- Soft Carry Case
- Certificate of Conformance

SPECIFICATIONS:

PARAMETERS	SPECIFICATIONS	
MODEL	OPM510	OPM520
Cal. Wavelength (nm)	850, 1300, 1310, 1490, 1550, 1625	
Measure range (dBm)	-65 ~ +10[1]	-50 ~ +27
Detector type	InGaAs	
Accuracy (dB)	±5% ±0.01nW (±0.5dB@850nm)	±5% ±1nW (±0.5dB@850nm)
Linearity	+/-0.5dB (+10 to -3dBm) +/-0.1dB (-3 to -50dBm) +/-0.5dB (-50 to -65dBm)	+/-0.5dB +27 to -3dBm +/-0.1dB -3 to -50dBm
Resolution (dB)	0.01dB	
Functions	W/mW/µW/dBm/dB(REF)/ MOD TONE DETECT 270Hz, 1kHz, 2kHz	
Connector Type	SC (Interchangeable LC, ST, SC)	
Fiber Type	Singlemode & Multimode	
Battery Life	> 100 Hours	
Power Supply	9V Alkaline or 1000mAh Lithium Battery/ 9V AC adapter	
Operating Temperature	-10°C ~ 50°C	
Storage Temperature	-20°C ~70°C	
Relative Humidity	0 TO 95% (NON-CONDENSING)	
Weight	0.68lbs (300g)	
Dimensions (H × W × T)	6.1 × 3.5 × 1.3" (155 × 88 × 33mm)	
IP Rating	IP54	
Vibration	5Hz to 150Hz, Amplitude+0.15mm	
Shock	Peak acceleration 25g at a pulse duration of 6ms	
Compliance	CE, FCC	

ORDERING INFORMATION:

PART NO.	CAT. NO.	DESCRIPTION
55500023	OPM510	InGaAs OPM +10 to -65dBm
55500024	OPM520	InGaAs OPM +27 to -50dBm

SLS520 STABILIZED LIGHT SOURCE

FEATURES

- Dual and Triple Wavelength Laser Sources at 1310, 1490, 1550, 1625 & 1650nm
- Dual Wavelength LED Source at 850nm & 1300nm
- Accurate Insertion Loss Measurements
- Tone and Probe Fiber Networks at 270Hz, 1kHz and 2kHz
- SC, LC, FC and ST Interchangeable Bulkheads
- Ruggedized Package, IP54 compliant
- Compatible with Singlemode and Multimode Networks
- Auto Off or Continuous On Operation
- Battery or 120/240VAC Operation

CONTENTS:

- Laser or LED
- SC Adapter
- Soft Carry Case
- Certificate of Conformance

SPECIFICATIONS:

MODEL	SLS520	SLS525	SLS530	SLS535	SLS536
Wavelength (±20nm)	1310/1550	850/1300	1310/1490/1550	1310/1550/1625	1310/1550/1650
Range of Use	Singlemode	Multimode (62.5/125)	Singlemode		
Emitter Type	FP	LED	FP		
Spectrum Width	≤ 5nm	+/-40nm	≤ 5nm		
Output Power	≤ 0dBm/-1dBm	-20dBm/-21dBm	≤ 0dBm/-1dBm		
Output Power Stability	±0.05 dB/15min; ±0.10dB/8hr	±0.05 dB/15min ±0.15dB/8hr	±0.05 dB/15min; ±0.10dB/8hr		
MOD Frequency	270, 1kHz, 2kHz				
Display	LCD				
Battery Life	60 Hours				
Connector Type	SC/PC (Interchangeable LC, ST, FC)				
Power Supply	9V Alkaline or 1000mAh Lithium Battery/ 9V AC adapter				
Operating Temp.	-10°C to 50°C				
Storage Temp.	-20°C to 70°C				
Relative Humidity	0 to 95% (non-condensing)				
Weight	0.71 lbs (300g)				
Dimension (H×W×T)	6.1 × 3.5 × 1.3" (155 × 89 × 33mm)				
IP Rating	IP54				
Vibration	5Hz to 150Hz, Amplitude = 0.15mm				
Shock	Peak acceleration 25g at a pulse duration of 6ms				
Compliance	CE, FCC, 21 CFR 1040.10 (Laser)				

ORDERING INFORMATION:

PART NO.	CAT. NO.	DESCRIPTION
55500018	SLS520	1310/1550nm Dual Laser
55500019	SLS525	850/1300nm Dual LED
55500020	SLS530	1310/1490/1550nm Triple Laser
55500021	SLS535	1310/1550/1625nm Triple Laser
55500022	SLS536	1310/1550/1650nm Triple Laser

OPTICAL POWER METER & STABILIZED LIGHT SOURCE KITS

ORDERING INFORMATION:

PART NO.	CAT. NO.	DESCRIPTION
55500027	SM DUAL KIT	OPM510 & SLS520
55500028	SM DUAL KIT HP	OPM520 & SLS520
55500029	MM DUAL KIT	OPM510 & SLS525
55500030	SM T PON KIT	OPM510 & SLS530
55500031	SMT 1625 KIT	SLS535 & OPM510
55500032	SMT 1650 KIT	SLS536 & OPM510
55500033	SMT PON KIT HP	SLS530 & OPM520
55500034	SMT 1625 KIT HP	SLS535 & OPM520
55500035	SMT 1650 KIT HP	SLS536 & OPM520
55500050	SMMMKIT-T	SLS520, SLS525 & OPM510
55500051	SMMMKIT-M	SLS520, SLS525 & OPM520

SMMM KIT-M

OPM AND SLS ACCESSORIES:

PART NO.	CAT. NO.	DESCRIPTION
55500048	PS-100	EXTERNAL POWER SUPPLY
55500036	CC-1	CARRY CASE, SOURCE/OPM
55500049	CC-2-3	CARRY CASE, DUAL, TRIPLE, SOURCE/OPM

TIA-568B & FOTP-171A CERTIFIED REFERENCE CABLES

SPECIFICATIONS:

Ferrule OD	2.4990 ±0.0005mm
Fiber to Ferrule Eccentricity	<0.25µm (SM) and <3µm (MM)
Insertion Loss	<0.15dB (SM, 1310/1550nm) and <0.25dB (MM, 850/1300nm)
Return Loss	>55dB (SM, 1310/1550nm) and >40dB (MM, 850/1300nm)
Beam Exit Angle	<0.25° (SM) and <0.5° (MM)
Standard Length	3m

HOW TO ORDER CABLE ASSEMBLY:

USE FOR SPECIFYING A PATCH CORD, PIGTAIL OR A CUSTOMER-SUPPLIED DEVICE.

Order Length ≤5 meters, Final Length -0% / +5% Order Length ≥5 meters, Final Length -0%/ +10%
Minimum Order Length: 1 foot. For shorter lengths, please call the factory!

ENTER ORDER CODES FROM PRICE LIST: □□□□–□□□R□□ □□–□□

CONNECTOR #1

CONNECTOR #2
ADDITIONAL OPTIONS:
00 = NO CONNECTOR
02 = CUSTOMER COMPONENT PIGTAIL

CABLE CODE LENGTH
IF FRACTIONAL LENGTHS:
"R" IS SUBSTITUTED FOR
DECIMAL POINT
= METERS
F = FEET, N = INCHES

CUSTOM OPTIC CODE
OPTIONAL

OPTICAL POWER
METER CALIBRATION GLOSSARY

ABSOLUTE POWER STANDARDS:
The reference photodetectors maintained by the National Institute of Standards and Technology (N.I.S.T.) in Boulder, Colorado. These reference photodetectors are used to transfer optical power calibration to two sets of Secondary Standards maintained by Tempo Communications Ltd.

ACTIVE SET OF SECONDARY STANDARDS/ACTIVE SECONDARY STANDARD:
The most recently calibrated set of Secondary Standards, which are used to calibrate Working Standards used on the production floor. An Active Secondary Standard is one of the photodetectors in the Active Set of Secondary Standards.

ADAPTER:
A mechanical device enabling the coupling and uncoupling of a connector. A bulkhead adapter is used to couple two terminated cable ends. An interface adapter is used to connect a cable to a light source, photodetector, or other device.

AGING OF STANDARDS:
A gradual deviation from specifications due to wear and the deterioration of associated electronic components.

ANSI CERTIFICATE OF CALIBRATION:
A Certificate of Calibration (see below) that includes additional information specified by American National Standards Institute document ANSI/NCSL Z540. In addition to manufacturer, performance, and traceability information, an ANSI Certificate of Calibration must include the name and address of the customer and a detailed description of the methods and Working Standards used to perform the calibration. The calibration status of the Working Standards used must also be documented. Furthermore, an ANSI Certificate of Calibration must include a statement that the certificate or report may not be reproduced, except in full, without written permission from the calibration laboratory.

BACKUP SET OF SECONDARY STANDARDS/BACKUP SECONDARY STANDARD:
The set of Secondary Standards with calibration older than one year, but not exceeding two years. The calibration points of the Backup Set of Secondary Standards are compared to the Active Set at monthly intervals to verify the accuracy of the latter. A Backup Secondary Standard is one of the photodetectors in the Backup Set of Secondary Standards.

CALIBRATION CONDITIONS:
The specific conditions under which a calibration factor is associated with a calibration wavelength. The calibration conditions typically include the centre wavelength and acceptable spectral deviation of the laser source in use; the output power of the laser source; the reference cable type and length; the type of connectors used to terminate the reference cable, including the manufacturer; the interface adapter used; and the ambient temperature and humidity conditions.

CALIBRATION FACTOR:
A number used to correlate the response of a photodetector in a manufactured instrument with the photodetector response of a Secondary Standard or Working Standard. In instruments manufactured by Tempo calibration factors are stored in non-volatile memory, and defined for each calibration wavelength.

CALIBRATION WAVELENGTH:
A specifically defined wavelength used during the point calibration of a manufactured instrument. The absolute accuracy of measurements performed at other than the calibration wavelength may vary, depending on the response linearity of the photodetector incorporated in the instrument at that wavelength. Calibration wavelengths are listed below:

CERTIFICATE OF CALIBRATION:

A document certifying that a manufactured instrument has been calibrated or re-calibrated to conform to published specifications, and that the calibration is traceable to an established standards bureau, i.e., the N.I.S.T. A Certificate of Calibration includes the following: the name and address of the manufacturer; the model number and description of the instrument; the instrument serial number; the condition in which the instrument was received and returned, i.e., within tolerance, out of tolerance, or non-operational; the calibration date, interval, and due date for re-calibration; the conditions under which the instrument was calibrated; the procedures used to perform the calibration; the identity of the calibration technician; and a signature of an authorized representative of the manufacturer.

CONNECTOR:

A mechanical device that allows an optical fiber or cable to be repeatedly coupled or uncoupled from an interface or another cable. An optical fiber fitted with connectors is said to be connectorised or terminated.

CONNECTOR REPEATABILITY:

The ability of a connector to be mated and unmated repeatedly without affecting its attenuation, return loss and other performance specifications. A lack of repeatability is usually attributable to the inability of a connector to maintain accurate and consistent alignment of the cores of the optical fibers.

FIBER OPTIC CABLE:

An optical fiber, multiple fibers, or fiber bundles, which may include a jacket and strength members (kevlar, steel, or other materials), fabricated to meet optical, mechanical, and environmental specifications.

LINEARITY:

The ability of a photodetector to generate electrical current in amounts proportional to the incident wavelength and intensity of light.

PHOTODETECTOR:

A semiconductor device that converts light energy into an electrical current. The conversion of light energy into electrical current is, in principle, proportional and linear with the incident power, which is expressed in Watts. The conversion ratio of a photodetector is dependent on the wavelength of the light received, therefore, this wavelength must be precisely defined for a point calibration (see below) to be valid.

POINT CALIBRATION:

The correlation of electrical current produced by a photodetector, quantified in Amps, with an incident power of light energy, expressed in Watts, at a single defined wavelength. This photodetector response is expressed in Amps-per-Watt (A/W

SECONDARY STANDARDS:

The reference photodetectors maintained by Tempo Secondary Standards are calibrated at regular intervals by the N.I.S.T. using the Absolute Power Standards maintained by the Institute. Tempo maintains two sets of Secondary Standards, each set containing one reference photodetector of Si and InGaAs composition. Each set of Secondary Standards alternates as Active and Backup at one-year intervals.

SPECTRAL DEVIATION:

The difference between the actual output wavelength of a light source and its specified wavelength. Spectral deviation is usually attributable to manufacturing tolerances.

UNCERTAINTY:

The margin of error for a calibration or measurement attributable to external causes, such as connector repeatability, ambient temperature, back-reflections, or spectral deviation from a defined calibration wavelength. Uncertainty will cause slight variations in optical power measurements unless the conditions and equipment used are identical to those employed during the calibration of the instrument. Uncertainty is typically expressed in percent (%).

WORKING STANDARDS:

A set of reference optical power meters incorporating photodetectors of Si or InGaAs composition that are calibrated using an Active Secondary Standard. These reference optical power meters are used to perform a point calibration of manufactured instruments at specified wavelengths.

INSERTION LOSS MEASUREMENT

WHAT IS INSERTION LOSS?

An insertion loss (IL) measurement characterizes the light loss through a component or connection.
There are two accepted methods for measuring insertion loss, both of which may be found in reference document FOTP-171, published by the Electronic Industry Association (EIA).
Insertion loss measurements require a light source, an optical power meter, and a patch cable manufactured to precise tolerances, known as a reference cable.
In general, an insertion loss measurement is a two step process:

1) Establish a baseline power level measurement for the light source and reference cable in use. This is referred to as "referencing" or "calibration."

2) Connect the device under test and measure the difference between the measured power and the Reference power.

INSERTION LOSS MEASUREMENTS

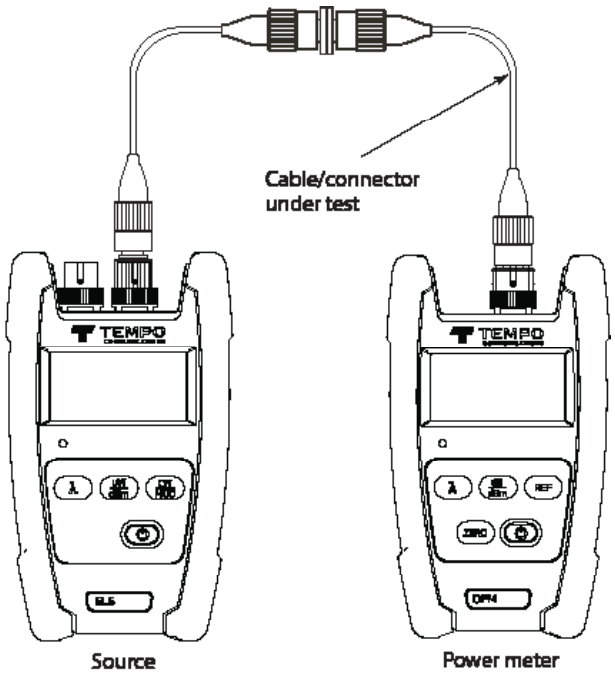
To measure the insertion loss of a connector/cable, do the following:

STEP 1: Connect an appropriate Tempo LED or laser source to the optical power meter using a suitable reference cable. The reference cable should be 2 to 3 meters in length. See the illustration.

STEP 2: Make sure the source is in continuous wave (CW) output mode. Set the optical power meter to the output wavelength of the source using the [λ] key and to dBm units using the [dBm] key. Note that the dBm output from the reference cable should be within acceptable limits.

STEP 3: Store the reference power level by pressing the [Rel] key for a few seconds. The main numerical display should read 00.00 dB.

STEP 4: Disconnect the reference cable from the optical power meter and insert the cable to be tested using an appropriate bulkhead adapter.



ABOUT dB, dBm, and WATTS

Fiber optic measurements are performed using decibel (dB) units.
The decibel is a logarithmic, relative, dimensionless unit it gives no indication of the absolute power level. Loss is always indicated using a minus (-) sign, and a gain is indicated by a plus (+) sign. Because dB units are relative and dimensionless, a correlation with an absolute unit of measure must be established to be useful. To indicate absolute power, logarithmic decibel units are referenced to linear Watt units: 0dBm = 1 milliwatt (mW).

To convert Watt units to dBm, the following formula is used: $P = 10 \log \left(\frac{Px}{1mW} \right) dBm$

The table on the right illustrates the relationship between absolute logarithmic dBm units and absolute linear Watt units: Absolute logarithmic dBm [P] Absolute linear Watts [Px]

dBm (P)	WATTS (Px)
+10dBm	10mW
+3dBm	2mW
0dBm	1mW
-3dBm	0.5mW
-10dBm	100µW
-20dBm	10µW
-30dBm	1µW
-40dBm	100nW
-50dBm	10nW
-60dBm	1nW
-70dBm	100pW
-80dBm	10pW
-90dBm	1pW

RETURN LOSS
MEASUREMENT METHODS

WHAT IS RETURN LOSS?

A return loss measurement characterises the strength of a reflection produced by variations in the refractive index along a fiber optic link, known as a back-reflection or Fresnel reflection. Quantified in decibel (dB) units, return loss is the logarithmic expression of the ratio of the reflected power over the incident power, that is, the intensity of light reflected back to the return loss meter over the intensity of the light injected into the fiber, expressed as a positive number.

If not controlled, back-reflections can degrade the performance of a fiber optic system by interfering with the operation of the laser transmitter, or by generating noise at the receiver.

A common source of back-reflections is the junction where two fiber optic connectors are mated. Because of this, a connector with high return loss, which sends very weak reflections back to the transmitter, is superior to a connector with low return loss that sends back strong reflections. When measuring connectors, extremely low return loss values usually indicate a defect, such as core misalignment, poor fiber end-face contact, scratches, breaks, or end-face contamination.

RETURN LOSS MEASUREMENT METHODS

OPTICAL TIME DOMAIN REFLECTOMETER (OTDR) METHOD

An Optical Time Domain Reflectometer (OTDR) launches a train of light pulses into the device under test and collects backscatter information as well as superimposed Fresnel reflections. The OTDR is optimised to accurately measure loss-per-distance based on the received backscatter level. An OTDR also gives an estimation of the strength of a reflection at a given distance based on its peak height.

RETURN LOSS DEFINED

Reflections—or more specifically Fresnel reflections—occur at the boundary between two media with different refractive indices. The percentage of the light reflected can be calculated if the refractive indices of both media are known.

The most commonly known percentage of reflected power, the 4% reflection, is caused by a glass-to-air boundary. Reflectance in general is the ratio of reflected power to incident power. When knowledge of a reflection at a discrete point is important, the term reflectance is preferred. Reflectance is expressed in negative decibels (dB). Optical return loss (ORL), often referred to as return loss, describes the ratio of reflected power over the incident power of a system as a whole. Similar in concept to reflectance, return loss is also expressed in decibels.