

# Multifunction Test and Measurement System

Optoplex's Multifunction Test and Measurement System (TM100 Series) is designed to provide a flexible and cost effective optical test and measurement solution, particularly for manufacturing lines. The mainframe can be mounted in 19" rack or stationed on desk-top for ease of use. There are many selections of the pluggable modules, from tunable laser, optical spectrum analyzer, EDFA, power meter, ASE light source, optical tunable filter, optical performance monitor, ..., etc.

- Broad selection of pluggable measurement modules
- Smart display and friendly GUI, enabling user configurable test setup via selected modules
- Programmable test & measurement recipes – ideal for manufacturing line
- Remote interface: GPIB, USB, Ethernet and WiFi



## Key Features and Benefits

- Mainframe with smart display and friendly GUI
- Built-in WiFi and Bluetooth
- Many selections of pluggable modules
- User configurable test setup with selected pluggable modules
- Smart and intelligent data management
- Independent access to pluggable module
- Cost-effective

## Applications

- Optical component characterization
- WDM component and module manufacturing line test
- Semiconductor laser manufacturing line – screening test
- GPON test and manufacturing
- Transceiver test and measurement
- Optical amplifier in transmission line measurement
- Fiber sensing system T&M
- Optical spectroscopic instrumentation T&M

## Mainframe

The mainframe is a standard 19" box either for rack-mount or for desk-top. A 7" touch-screen is built-in for ease of use the measurement system. A friendly GUI is designed such that user can easily configure their test setup and test conditions based on their selected pluggable measurement modules. The user can save the recipe of the setup and settings such that operators can easily load and run it next time. This is convenient and useful for manufacturing line test and measurement.

The interfaces include GPIB, USB, Ethernet and WiFi. Remote control of the test and measurement and display of the measurement results can be done via Ethernet or WiFi.



## Pluggable Measurement Modules

There is a broad selection of pluggable modules. They include

- Tunable Lasers: C-Band, L-Band, S-Band, O-Band
- ASE Light Sources: C-Band, L-Band
- Comb Light Sources: 100GHz, 50GHz and 25GHz; C- or L-Band
- Optical Spectrum Analyzers: C-, L-, C+L, O-, and Full-Band (1250 ~ 1650nm)
- Optical Performance Monitor/Optical Channel Monitor: C-Band; 100GHz or 50GHz
- Optical Tunable Filters: C-, L-, C+L, S-, O-, and Full-Band (1250 ~ 1650nm)
- EDFA: C- or L-Band, +20dBm max output
- Optical Power Meters:
- Optical Switch:
- Optical Attenuators:
- Optical Rulers: 100GHz, 50GHz and 25GHz



## Tunable Lasers

**Tunable Specifications**

Model	TM100-101	TM100-102	TM100-103	TM100-104	TM100-105
Operating Wavelength	C-Band	L-Band	S-Band	O-Band	
Output power	8-14dBm	8-14dBm	8-14dBm	8-14dBm	
SMSR	40-45dB	40-45dB	40-45dB	40-45dB	
Linewidth	1-5MHz	1-5MHz	1-5MHz	1-5MHz	
RIN (10MHz-1GHz) (1-10GHz)	-110 dB/Hz -145 dB/Hz	-110 dB/Hz -145 dB/Hz	-110 dB/Hz -145 dB/Hz	-110 dB/Hz -145 dB/Hz	
OSNR	50	50	50	50	
Frequency accuracy	+/-108GHz	+/-108GHz	+/-108GHz	+/-108GHz	
Shuttered output power	-35~-30dBm	-35~-30dBm	-35~-30dBm	-35~-30dBm	
Tuning Speed	10ms	10ms	10ms	10ms	

In addition to the pluggable modules to be used with TM100 mainframe, Optoplex also offers stand-alone tunable laser modules.

For more detail information about Optoplex's tunable lasers, please visit  
[http://www.optoplex.com/Tunable\\_Laser\\_ITLA.htm](http://www.optoplex.com/Tunable_Laser_ITLA.htm)

## ASE Light Sources

Model	TM100-201	TM100-202	TM100-205
Operating Wavelength	C-Band	L-Band	C+L Band
Output Power	20dBm	20dBm	20dBm
Spectral Density	>-10dBm/nm	>-10dBm/nm	>-10dBm/nm
Power stability	+/-0.02dB	+/-0.02dB	+/-0.02dB
Flatness	12dB	12dB	12dB
Power Consumption	10W	10W	10W

## ASE Comb Light Sources <sup>1)</sup>

Model	TM100-211	TM100-212	TM100-213	TM100-214	TM100-215	TM100-216
Operating Wavelength	C-Band	C-Band	C- Band	L-Band	L-Band	L-Band
FSR	100GHz	50GHz	25GHz	100GHz	50GHz	25GHz
Spectral Density	>-10dBm/nm	>-10dBm/nm	>-10dBm/nm	>-10dBm/nm	>-10dBm/nm	>-10dBm/nm
Power stability	+/-0.02dB	+/-0.02dB	+/-0.02dB	+/-0.02dB	+/-0.02dB	+/-0.02dB
Flatness	12dB	12dB	12dB	12dB	12dB	12dB
Power Consumption	10W	10W	10W	10W	10W	10W

### *Note*

1) *Other performance refers to the ASE light source for the corresponding operating wavelength.*

ASE Comb Light Source is an ideal light source for simultaneous test and measurement of multi-channel optical components, modules and systems, such as DWDM.

## Optical Spectrum Analyzers

In addition to pluggable OSA used in conjunction with Optoplex's T&M system, TM100. Optoplex has stand-alone OSA products, from OEM modules to handheld OSA.



### OSA OEM Modules:

[http://www.optoplex.com/OSA\\_OEM\\_Modules.htm](http://www.optoplex.com/OSA_OEM_Modules.htm)

### Handheld OSA:

[http://www.optoplex.com/Handheld\\_OSA.htm](http://www.optoplex.com/Handheld_OSA.htm)

### Desk-Top OSA

[http://www.optoplex.com/Desktop\\_OSA\\_System.htm](http://www.optoplex.com/Desktop_OSA_System.htm)

Model	/	TM100-501	TM100-502	TM100-503	TM100-505		
<b>Spectral Measurement</b>							
Parameter	Unit	C-Band	C+L Band	O-Band	Full-Band		Note
Wavelength Range <sup>1</sup>	nm	1527 – 1567	1525 - 1605	1260 – 1360	1250 - 1650		
Resolution Bandwidth (FWHM)	nm	0.05	0.2	0.2	2.0		
Wavelength Accuracy	nm	0.05	0.2	0.2	2.0		
Wavelength Repeatability <sup>2)</sup>	nm	± 0.015	± 0.03	± 0.03	± 1.0		
Wavelength Readout Resolution	pm	1	1	1	1		
Wavelength Linearity	nm	± 0.01	± 0.01	± 0.01	± 0.01		
<b>Power Measurement</b>							
Dynamic Range	dB	+20 ~ -70	+20 ~ -70	+23 ~ -65	+20 ~ -65		
Power Accuracy	dB	± 0.5	± 0.5	± 0.5	± 1.0		
Power Repeatability	dB	± 0.1	± 0.1	± 0.1	± 0.1		
Power Readout Resolution	dB	± 0.01	± 0.01	± 0.01	± 0.01		
Linearity	dB	± 0.1	± 0.1	± 0.1	± 0.1		
<b>Optical Rejection Ratio (ORR)</b>							
@12.5GHz (0.1nm)		40	35	35			
@25GHz (0.2nm)		55	50	50	50		
@50GHz (0.4nm)		65	60	60	60		
@100GHz (0.8nm)		70	65	65	65		
Scanning Time (Full-Band)	s				5		
C-Band	s				0.5		

## Optical Performance Monitor (OPM) /Optical Channel Monitor (OCM)

Optoplex has been a leading manufacturer and supplier of Optical Performance Monitor (OPM) and Optical Channel Monitor (OCM) for telecom applications. More than 15,000 units of OPM/OCM have been deployed world-wide in the past 10 years.



The pluggable OPM/OCM is a variant of Optoplex's famous OPM/OCM OEM modules, specially designed for use in conjunction with Optoplex's TM100 system. It has the same performance as those stand-alone OEM modules.

Model		TM100-601	TM100-602	TM100-603	TM100-604
Parameter	Unit	C-Band	C-Band	L-Band	L-Band
Channel Spacing	GHz	50	100	50	100
Wavelength Range	nm	1527 – 1567	1527 – 1567	1570 - 1610	1570 - 1610
Channel Number	-	85	85	85	85
Maximum Input Power	dBm	23	23	23	23
Channel Input Power Range	dBm	-10 ~ -40	-10 ~ -40	-10 ~ -40	-10 ~ -40
Absolute Channel Power Accuracy	dB	± 0.7	± 0.7	± 0.7	± 0.7
Power Measurement Repeatability	dB	± 0.1	± 0.1	± 0.1	± 0.1
Total Input Power Accuracy	dB	± 1.5	± 1.5	± 1.5	± 1.5
PDL	dB	<0.3	<0.3	<0.3	<0.3
Absolute Wavelength Accuracy	pm	± 70	± 70	± 70	± 70
OSNR	dB	10 - 25	10 - 25	10 - 25	10 - 25
Noise Floor	dBm	-60	-60	-60	-60
Response Time	s	2 ~ 3	2 ~ 3	2 ~ 3	2 ~ 3
Power Consumption	W	< 2	< 2	< 2	< 2

## Tunable Optical Filters (TOF)

Like OPM/OCM, Optoplex is a leading manufacturer and supplier of tunable optical filters (TOF) for DWDM optical communications. Major products include 100GHz and 50GHz channel spacing TOFs.

In addition to the TOF based on DWDM thin film filter (TFF) and rational motor, Optoplex has MEMS-Grating based TOF products as well.

Recently, a new TOF based on fiber F-P etalon is released.

Those new TOFs based on MEMS and fiber F-P are designed for continuous tuning as well as channelized for DWDM applications. Custom-design of TOFs is available upon request.

Model		TM100-701	TM100-702	TM100-703	TM100-704	TM100-705
Parameter	Unit	C-Band	L-Band	C+L Band	O-Band	Full-Band
Wavelength Tuning Range		1525 ~ 1565				
Wavelength Tuning Resolution	<i>pm</i>	< 10	< 10	< 10	< 10	< 10
Bandwidth <sup>1</sup> @ 1.0 dB	<i>GHz</i>	> 16	> 16	> 16	> 16	> 16
Bandwidth <sup>1</sup> @ 3.0 dB	<i>GHz</i>	~ 25	~ 25	~ 25	~ 25	~ 25
Bandwidth <sup>1</sup> @ 20 dB	<i>GHz</i>	< 85	< 85	< 85	< 85	< 85
Peak Insertion Loss <sup>1</sup> (without connector)	<i>dB</i>	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Polarization Dependent Loss <sup>1</sup>	<i>dB</i>	< 0.3 @ CW	< 0.3 @ CW	< 0.3 @ CW	< 0.3 @ CW	< 0.3 @ CW
Polarization Mode Dispersion	<i>ps</i>	0.5	0.5	0.5	0.5	0.5
Chromatic Dispersion <sup>1</sup>	<i>ps/nm</i>	< ±100 within CW ± 5 GHz	< ±100 within CW ± 5 GHz	< ±100 within CW ± 5 GHz	< ±100 within CW ± 5 GHz	< ±100 within CW ± 5 GHz
Wavelength Setting Error <sup>2</sup>	<i>GHz</i>	< ±4	< ±4	< ±4	< ±4	< ±4
Wavelength Repeatability <sup>2</sup>	<i>GHz</i>	± 1	± 1	± 1	± 1	± 1
Wavelength Temperature Dependence	<i>pm/°C</i>	< ±1	< ±1	< ±1	< ±1	< ±1
Return Loss	<i>dB</i>	> 40	> 40	> 40	> 40	> 40
Maximum Input Optical Power	<i>mW</i>	300	300	300	300	300
Tuning Speed, worse case	<i>ms</i>	< 500	< 500	< 500	< 500	< 500

## EDFA

Model		TM100-801	TM100-802	TM100-803	TM100-804
Parameter	Unit	C-Band	C-Band	L-Band	L-Band
Max Output Power		+20dBm	+13dBm	+20dBm	+13dBm
Wavelength Range	nm	1527 – 1567	1527 – 1567	1570 - 1610	1570 - 1610
Optical Input Power	dB	-30~-10	-30~-10	-30~-10	-30~-10
Signal Gain	dB	15-25	15-25	15-25	15-25
Noise Figure @ Pin=-30dBm & Gain=15dB	dB	7.0	7.0	7.0	7.0
Saturation Total Output Power @ Pin=-10dBm	dBm	xx	xx	xx	xx
Gain Flatness @ Gain=23dB	dB	+/-1	+/-1	+/-1	+/-1
Gain Flatness @ Gain=15-25dB	dB	+/-2	+/-2	+/-2	+/-2
Polarization Dependent Gain	dB	0.5	0.5	0.5	0.5
Polarization Mode Dispersion	ps	0.5	0.5	0.5	0.5
Input/Output Return Loss (pump LD off)	dB	35	35	35	35

Optoplex also manufactures and supplies stand-alone EDFA modules, including Gain Block and MSA Full Function modules.

Contact Optoplex for details.



## Optical Rulers

Model		TM100-901	TM100-902	TM100-903	TM100-904	TM100-905	TM100-906
Parameter	Unit	C-Band	C-Band	C-Band	L-Band	L-Band	L-Band
Etalon FSR		100GHz	50GHz	25GHz	100GHz	50GHz	25GHz
Wavelength Range	<i>nm</i>	1527 – 1567	1527 – 1567	1570 - 1610	1570 - 1610		
Insertion Loss (without connector)	<i>dB</i>	1	1	1	1	1	1
Insertion Loss Uniformity	<i>dB</i>	0.5	0.5	0.5	0.5	0.5	0.5
PDL	<i>dB</i>	0.3	0.3	0.3	0.3	0.3	0.3
Return Loss	<i>dB</i>	40	40	40	40	40	40
Max Input Power	<i>mW</i>	300	300	300	300	300	300

## Optical Power Meters

Model		TM100-301	TM100-302	TM100-311	TM100-312
Parameter		Single	Single, High Power	Dual	Dual, High Power
Wavelength Range	<i>nm</i>				
Input Power Range	<i>dBm</i>	0-50	0-50	0-50	0-50
Power Accuracy	<i>dB</i>	+/-0.5	+/-0.5	+/-0.5	+/-0.5
Power Measurement Repeatability	<i>dB</i>	+/-0.1	+/-0.1	+/-0.1	+/-0.1
PDL	<i>dB</i>	0.3	0.3	0.3	0.3
Noise Floor	<i>dBm</i>	-55	-55	-55	-55
Response Time	<i>ms</i>	1000	1000	1000	1000
Operating Temperature	<i>°C</i>	-5-65	-5-65	-5-65	-5-65
Storage Temperature	<i>°C</i>	-40-80	-40-80	-40-80	-40-80

## Optical Attenuators

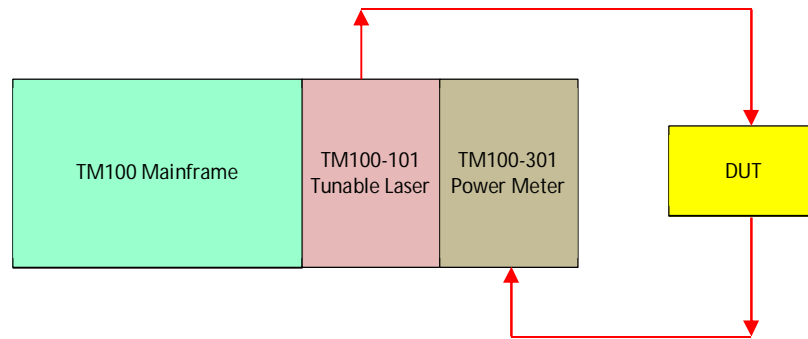
Model		TM100-401	TM100-402	TM100-411	TM100-412
Parameter		Single	Single, Large Dynamic Range	Dual	Dual, Large Dynamic Range
Wavelength Range	<i>nm</i>				
Residual Attenuation	<i>dB</i>	1.5	1.5	1.5	1.5
Attenuation Range	<i>dB</i>	50	50	50	50
Attenuation Resolution	<i>dB</i>	0.1	0.1	0.1	0.1
Back Reflection	<i>dB</i>	55	55	55	55
Polarization Sensitivity	<i>dB</i>	0.2	0.2	0.2	0.2
Maximum input Optical Power	<i>mW</i>	300	300	300	300
Thermal Stability	<i>dB/°C</i>	0.03	0.03	0.03	0.03
Operating Temperature	<i>°C</i>	0-60	0-60	0-60	0-60
Storage Temperature	<i>°C</i>	-40-75	-40-75	-40-75	-40-75

## Optical Switches

Model		TM100-451	TM100-452	TM100-461	TM100-462
Parameter		1x2	1x4	2x2	2x4
Wavelength Range	<i>nm</i>				
Insertion Loss	<i>dB</i>	0.7	0.8	1.0	1.2
Crosstalk	<i>dB</i>	-50	-50	-50	-50
Back Reflection	<i>dB</i>	-50	-50	-50	-50
TDL	<i>dB</i>	0.3	0.3	0.3	0.3
WDL	<i>dB</i>	0.2	0.2	0.2	0.2
PDL	<i>dB</i>	0.1	0.1	0.1	0.1
Repeatability	<i>dB</i>	0.02	0.02	0.02	0.02
Optical Power	<i>mW</i>	300	300	300	300
Switching Time	<i>ms</i>	10	15	20	20
Operating Temp	<i>°C</i>	-5~70	-5~70	-5~70	-5~70
Storage Temp	<i>°C</i>	-40~85	-40~85	-40~85	-40~85
Fiber Type		9/125 mm single mode			

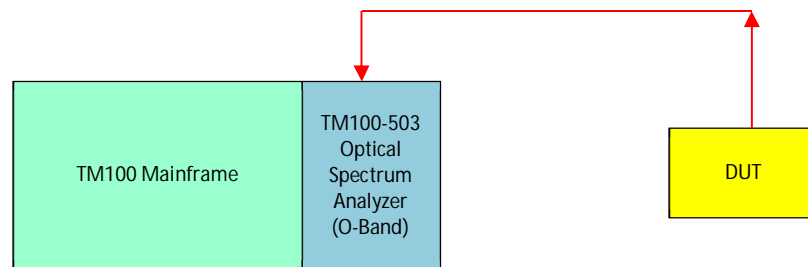
# Test & Measurement Applications (Examples)

## Optical Component Characterization



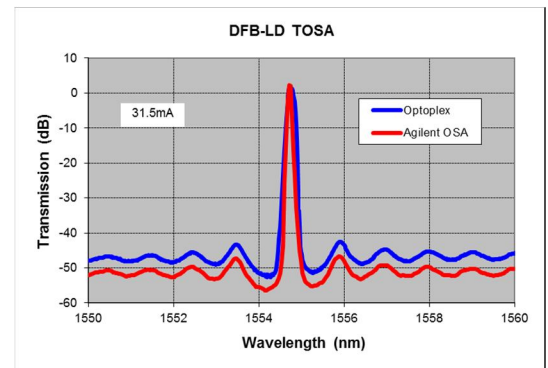
Using tunable laser and power meter to test optical component's characteristics, such as transmission or reflection spectrum, insertion loss, bandwidth, etc. Such as to test a DWDM filter.

## Laser Diode Screening Test

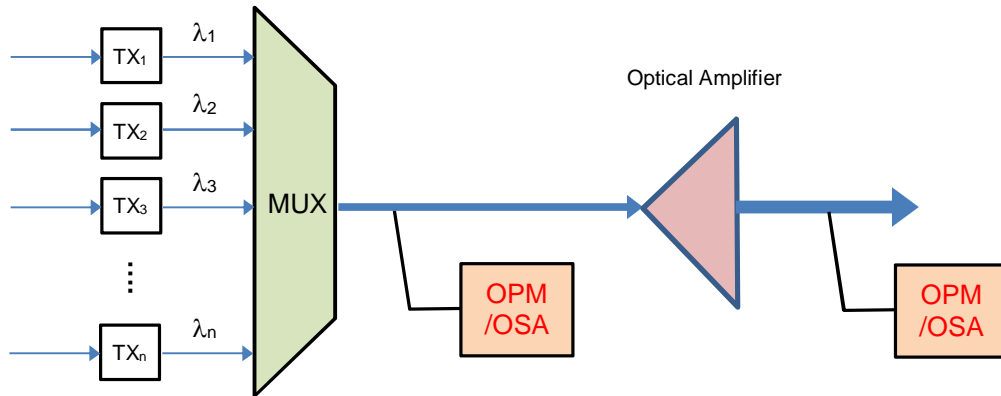


Fast scanning OSA (O-band or C-band) is an ideal instrument used in DFB laser diode (wafer level) screening test to measure the SMSR. With scanning speed as high as 50ms, it can dramatically improve the measurement cycle time and therefore the throughput.

It is a low-cost replacement to expensive Agilent or Yokogawa's OSA for dedicated manufacturing line test and measurement applications.

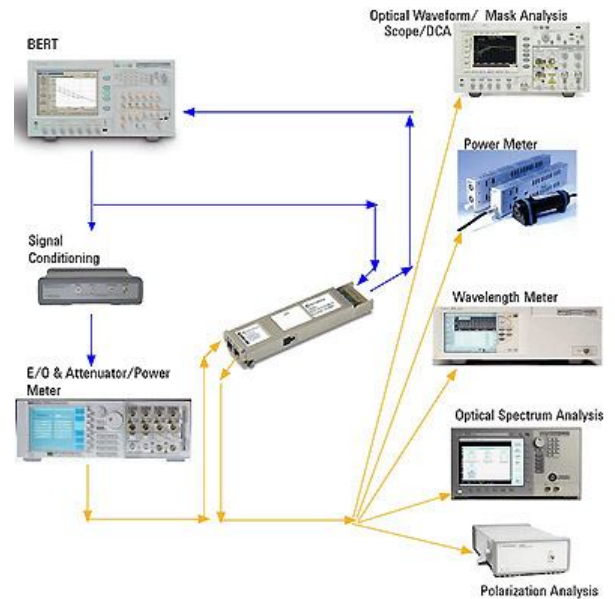


## Optical Transmitter and Fiber Amplifier Measurements



## Transceiver Measurement

Optoplex's TM100 measurement systems, in conjunction with pluggable modules, such as VOA, Power Meter, OSA, ....., is a good solution for optical transceiver test and measurement.



## Contact Information

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