



FIBER OPTIC TECHNOLOGY  
CALIBRATION LABORATORY

# PM-4212 series Pocket Optical Power Meter

## *INSTRUCTION MANUAL*



Revision 1.1



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## 1 Introduction

The PM-4212 is four channel optical power meter, designed for continuous measurement of optical lines or for fiber optics work station for measurement optical power of various devices. PM-4212 is assembled with USB port and Ethernet port for communication with control application. PM-4212 can be easily placed within rack mount ODF's with the display on the top or on the side. The NiMH rechargeable battery ensures a long term working time. The instrument can be used separately to measure absolute or relative optical power in optical networks or with the LS-800 Optical Light Source or OFT-820 Loss Test Set for optical loss measurement on single mode and multimode fiber cable with six working wavelengths.

## 2 Features

- Stand-alone power meter
- USB probe – accessory for testing workstation
- Ethernet probe – accessory for testing workstation
- Small size, lightweight
- Channel power meter
- Aluminum case
- SM & MM fiber testing
- Easy changeable connectors for wide ranging applications
- Absolute and Relative optical power measurement
- Ethernet RJ-45 port and USB port:
- For full control via simple commands
- USB port:
- For firmware upgrade
- For charging the battery
- Built-in NiMH rechargeable battery pack
- Battery status indicator, Auto Off

## 3 Application

- Absolute or relative optical power measurement.
- Optical network testing.
- Measurement output power of optical transmitters.
- Measurement input power at optical receivers.
- Measurement attenuation in fiber cabling, in conjunction with the LS-800 Optical light source or the OFT-820 Loss Test Set.
- Measurement loss of connectors, splices, adaptors, switches and other fiber optic components.
- Suitable for SM and MM applications.

## 4 Accessories

### 4.1 Standard

- Power meter
- FC adaptor (TE-ASP-FC)
- Power charging adaptor
- Traceable calibration certificate
- USB cable

### 4.2 Optional

- Master patchcords
- Master adaptors
- Universal SFF 1.25 mm adaptor (TE-ADP-125)
- Hard carry case (TE-HC-01)



**PM-4212**

TE-ADP-FC

TE-ADP-LC

TE-ADP-SC

TE-ADP-250

TE-ADP-125

**PM-4212-SI3**

TE-ASP-FC

TE-ASP-LC

TE-ASP-SC

TE-ASP-250

N/A



TE-HC-01



Power charging adaptor

## 5 Specifications

Power meter	PM-4212	PM-4212-SI3	Unit
Photo detector	1 mm InGaAs	3.6 mm Si	
Working wavelengths	850, 1300, 1310 1490, 1550, 1625	650, 850, 980	nm
Dynamic range	-60 to +10 <sup>1</sup>	-65 to +10	dBm
Uncertainty	± 5		%
Resolution	0.01		
<b>General specifications</b>			
Dimensions	100 x 105 x 40 <sup>2</sup>		mm
Weight	340		g
Operation temperature	-10 to + 50		°C
Storage temperature	-40 to + 70		°C
Humidity (non-condensing)	0 to 95		%
Battery working time	100 <sup>3</sup>		h

## 6 Safety information

The PM 4212 instrument emits no optical power itself and does not create any hazards to the user.

- Never use magnifying devices to inspect optical fiber ends unless you are sure that no optical power is being emitted.
- Use only magnifying devices with a built-in infra-red filter to ensure safety.
- During operation, testing or maintenance of a fiber optic system, never look into an active fiber optic cable. Infrared radiation may be present and permanent eye damage can result.
- Avoid direct exposure to the beam.
- Do not activate the laser when there is no fiber attached to the optical output connector

Under no circumstances should you look into the end of an optical cable attached to the optical output when the device is operational. Laser radiation can seriously damage your eyesight.

---

Note: 1) Apply for SM wavelength: 1300, 1310, 1490, 1550, 1625 nm

2) With adapter

3) Without Ethernet module

## 7 Maintenance

### 7.1 Battery care

The PM 4212 comes equipped with a built-in charger and internal battery pack.

- Before using the PM 4212 for first time, fully charge the battery.
- Use the USB charger for charging.
- Charging is not recommended until battery status is 30% or less. Recommended charging time of battery pack is 10 to 12 hrs.
- Charge the battery pack fully before storing PM 4212 for a long period. The batteries will lose its charge during time.
- If you are not going to use the PM 4212 for long period, charge the battery pack once every six months.
- The battery pack is a consumable. Please contact OPTOKON for battery pack replacement.
- To extend battery pack life it is recommended that batteries are completely drained before re-charging – battery refresh. Otherwise the batteries lose its ability to fully recharge

### 7.2 Instrument care

- During storage and transport keep the instrument in its carry case to protect against any damage, vibration, dust and moisture.
- Where possible keep the instrument away from direct sunlight.
- Clean the tester using alcohol or other cleaning agents. Acetone or other active solvents may damage the plastic parts of case.

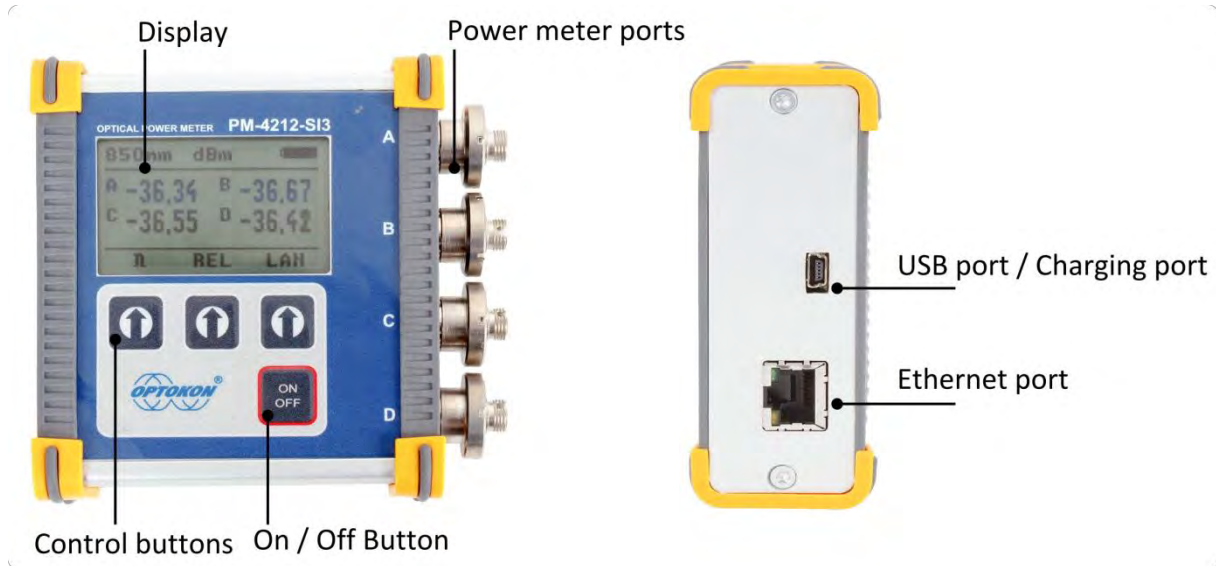
### 7.3 Optical connector care

- Cleanliness will affect the performance of an optical fiber system.
- All connectors and fiber end faces need to be clean prior to testing.
- Clean all connectors, adapters, and attenuators before making any connections.
- Use appropriate optical cleaning supplies to keep connectors and adaptors free from contamination.
- The following cleaning materials are recommended and can form part of your cleaning kit:
  - Lint-free laboratory wipes.
  - Isopropyl alcohol in pressurized dispenser
  - Lint free pipe cleaners
  - Clean, dry, oil-free compressed air

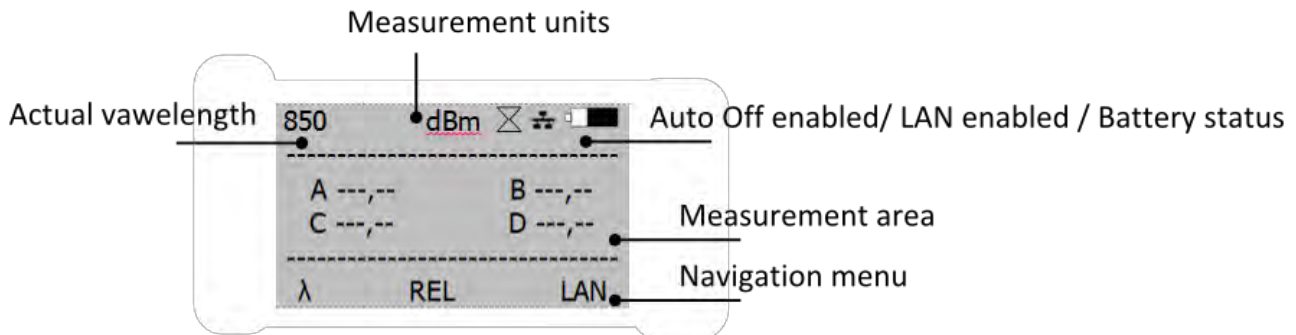
## 8 Description

### 8.1 Physical description

The PM-4212 power meter is a compact unit intended for using in measurement workstation.



### 8.2 Screen description



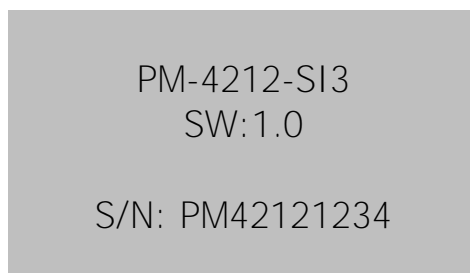
### 8.3 Turning On the PM-4212



Before using the PM 4212 for first time, fully charge the battery.

Press ON/OFF button to turn the unit On

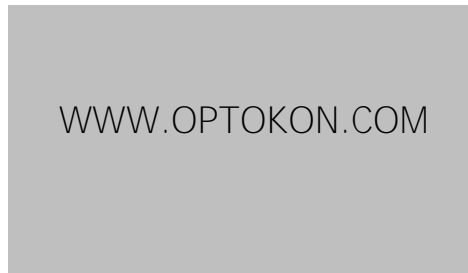
During power on initialization, the type of device, serial number and firmware version is shown on the display





### 8.4 Turning Off the PM-4212

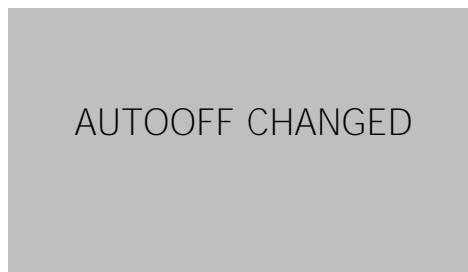
Press ON/OFF button to turn the unit Off



### 8.5 Enable automatic turning off

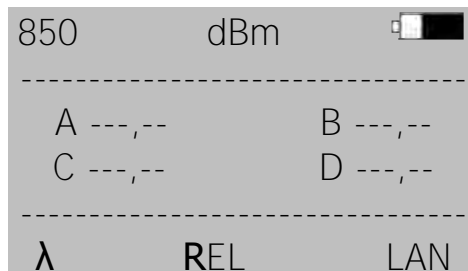
Press and hold the ON/OFF key to Enable/Disable the AUTO OFF feature. The unit will display "AUTOOFF CHANGED" and the symbol "⌘" will be displayed. (Auto OFF is enabled).

If Auto Off is enabled, the unit will switch off after 10 minutes of inactivity.



### 8.6 Absolute power measurement mode

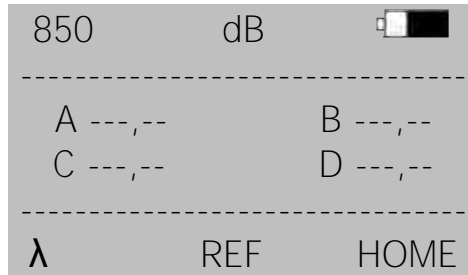
In the absolute power measurement mode the absolute values of the all 4 optical signal are shown on the display. A, B, C, D corresponds with the port of the same name. The measurement unit is dBm.



- λ Change measured wavelengths.
- REL Change operating mode to the relative power measurement mode (unit dB).
- LAN Enter LAN module configuration menu

### 8.7 Relative power measurement mode

In the relative power measurement mode, the relative values of all 4 optical signals are shown on the display. The value is relative to reference value, Ka1. The measurement unit is dB.



- λ Change measured wavelengths.
- REF Set the reference value
- HOME Leave relative power measurement mode

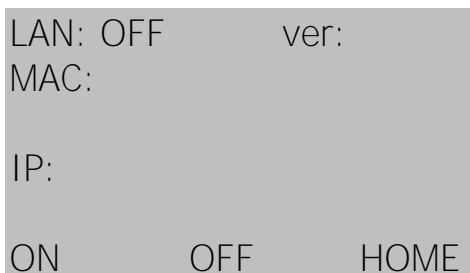
#### 8.7.1 Setting reference

By pressing REF button in relative power measurement mode, the submenu with confirm dialog appears. Reference value is done for all 4 channels at once.



### 8.8 LAN control menu

The PM-4212 power meter is assembled with the LAN Ethernet module. In this submenu it is possible to Disable or Enable the LAN module as well as to read connection details. The LAN Ethernet module has significant power consumption, and reduces the operational time of tester unit.



- ON Enable LAN Ethernet module
- OFF Disable LAN Ethernet module
- HOME Leave the LAN configuration

## 9 Insertion Loss Measurement

The main purpose of this procedure is to measure the decrease of optical power in optical fiber of specific length of fiber.

The insertion loss is caused by combination of imperfection of individual parts of optical line. Main factors are the optical connectors, optical fiber length, fiber geometry, type of fiber (SM or MM)

### 9.1 General description

For measuring of insertion loss exist many methods but the main idea is the same for all of them. The first step is to set the reference value on the power meter by measuring insertion loss of defined master patch cord. Second step is connecting the measured optical fiber and measuring the insertion loss. The output of measurement is defined as the drop of amount of transferred optical power and it is expressed as the ratio in decibels (dB).

The IEC 874-1 defines 8 methods of measuring of insertion loss. OPTOKON power meters are designed for method 6 and 7.

For measuring of insertion loss is necessary to have the source of optical power like OPTOKON LS-800 and the optical power meter like PM-4212 and the master patch cord for setting the reference value.

## 9.2 Method 6

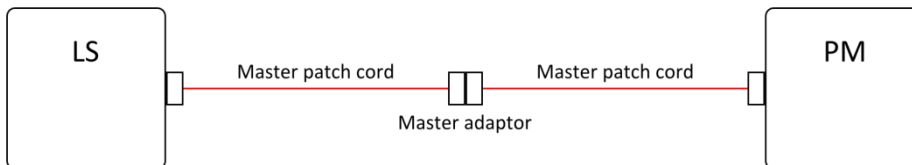
Method 6 uses two master patch cords to set the reference. Method 6 cancels the effects of the master cords and one adaptor for all subsequent measurements.

### Requirements:

- 2x master patch cord
- 2x master adaptor
- 1x PM
- 1x LS

### 9.2.1 Setting the reference

1. Use cleaning kit to clean the master patch cord connectors.
2. Connect the first master patch cord to the power meter
3. Connect the second master patch cord to the light source.
4. Use the master adaptor to connect both master patch cords.
5. Power on the light source and select the appropriate wavelength.
6. Power on the power meter and select the appropriate wavelength.
7. On the power meter activate the relative power measurement mode by pushing [REL] button.
8. Set new reference for the selected wavelength by pushing [REF] button and confirm by pressing the [CONFIRM] button.

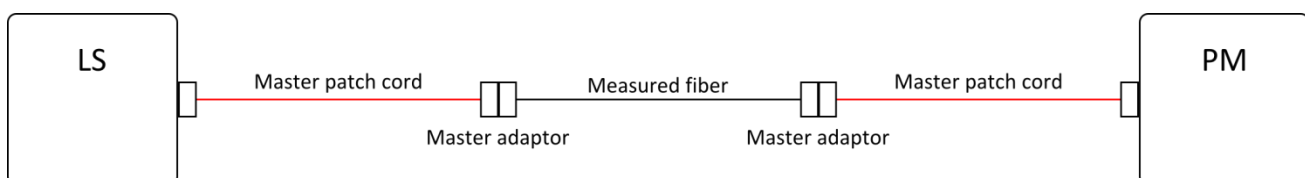


### 9.2.2 Measurement Loss



Do not disconnect the master patch cords from the light source and the power meter. If it happens, the measurement is lost, and you have to start again from beginning.

- 1) Disconnect master patch cord from the master adaptor.
- 2) Use cleaning kit to clean connectors of measured fiber.
- 3) Connect one end of measured fiber to the master adaptor. Use second master adaptor to connect other end of measured fiber to free master patch cord.
- 4) The power meter displays the loss in dB.



### 9.3 Method 7

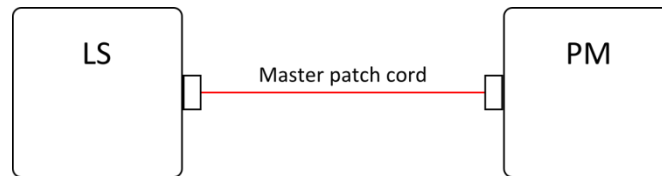
For method 7, one master cord is used to set the reference. The master cord will be cancelled for all subsequent measurements.

#### Requirements:

- 1x master patch cord
- 1x master adaptor
- 1x LS
- 1x PM

#### 9.3.1 Setting the reference

- 1) Connect the master patch cord to the power meter
- 2) Connect the second end of the master patch cord to the light source
- 3) Power on the light source and select the appropriate wavelength
- 4) Power on the power meter and select the appropriate wavelength
- 5) On the power meter activate the relative power measurement mode by pushing [REL] button.
- 6) Set new reference for the selected wavelength by pushing [REF] button and confirm by pressing the [CONFIRM] button.

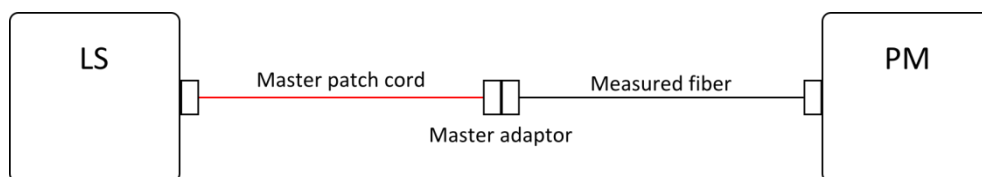


#### 9.3.2 Measurement Loss



Do not disconnect the master patch cords from the light source. If it happens, the measurement is lost, and you have to start again from beginning.

- 1) Disconnect the master cord from the power meter port.
- 2) Connect one end of measured fiber to the master adaptor and other end of measured fiber to the power meter
- 3) The power meter displays the loss in dB.



## 10 Connecting with control software

The PM-4212 power meter can be controlled from PC over USB or over Ethernet network.

### 10.1 USB

To communicate with PM-4212 over USB is necessary to have some software for direct communication over serial line like HyperTerminal or PuTTY, Personal Computer with USB port and mini USB cable.

#### Serial line configuration:

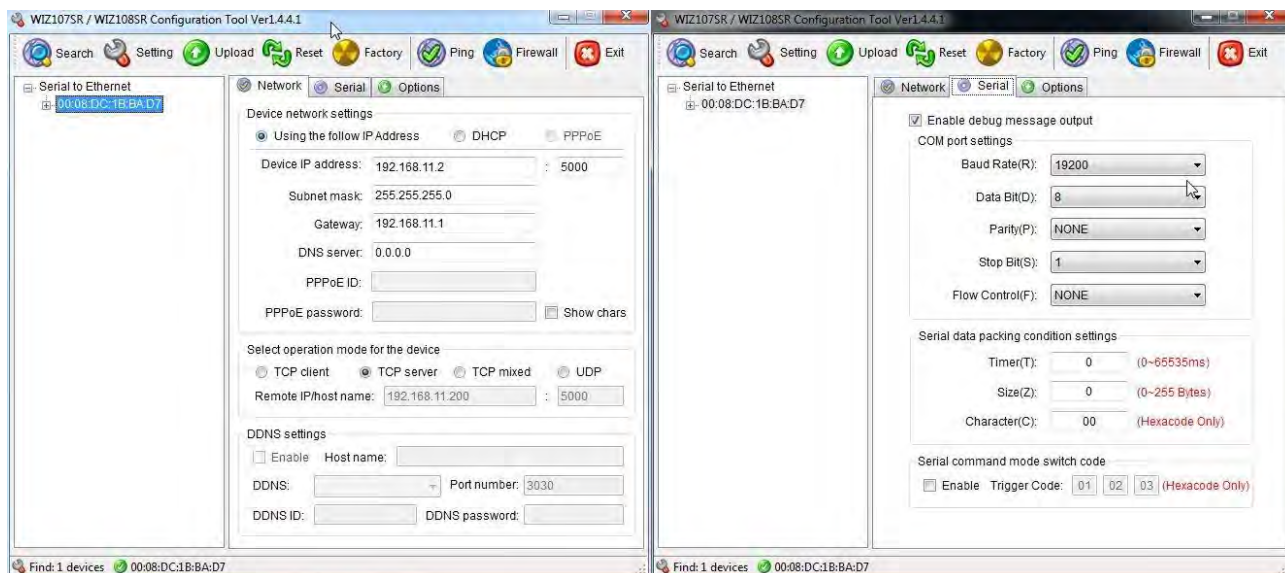
Baud rate: 19200  
 Data bits: 8  
 Parity: None  
 Stop bit: 1  
 Flow control: None

- 1) Connect the PM-4212 to a PC using the USB cable provided and turn the PM-4212 on. The PC will install the drivers for new hardware. If it is not done automatically, use the drivers on the CD provided by OPTOKON.
- 2) Start the program for serial communication and configure it according to configuration above

*Note: For use the USB port is necessary to disable the LAN Ethernet module (See LAN control menu 8.8)*

### 10.2 Ethernet network

To communicate with PM-4212 over Ethernet network is necessary to install “Config Tool” software, which is available on <https://www.optokon.com/category/86-standard-testers> or on Wiznet<sup>4</sup> webpage.



- 1) Click on “Search” to find connected device
- 2) Fill in desired IP setting
- 3) Check if serial setting is as on the picture above
- 4) Click on “Setting” to save the changes

*Note: 4) <https://www.wiznet.io/product-item/wiz108sr-evb/>*

### 10.3 Control commands

Control is performed by entering commands that are written to the window of serial communication software.

<b>Command</b>	<b>Significance</b>	<b>Note</b>
n	Return device type and serial number	
l	Return Actual wavelength	
r	Return actual reference	Relative power measurement mode
	Return "--"	Absolute power measurement mode
a	Returns measured power level for channel A	
b	Returns measured power level for channel B	
c	Returns measured power level for channel C	
d	Returns measured power level for channel D	
v	Returns measured power levels for all channels	<b>Separated by TAB key (09h)</b>
0	Set the device into a home position	
1	Simulation of pushing first button	
2	Simulation of pushing second button	
3	Simulation of pushing third button	

### 10.4 Output example

```
n
PM4212 PM42121234
l
0850
a
-03.60
v
-03.60  ---.---  ---.---  ---.---
```

## 11 Power loss conversion table

Loss [dB]	Loss [%]	Loss [dB]	Loss [%]	Loss [dB]	Loss [%]
0	0,0	0,8	16,8	7	80,0
0,1	2,3	0,9	18,7	8	84,2
0,2	4,5	1	20,6	9	87,7
0,3	6,7	2	36,9	10	90,0
0,4	8,8	3	49,9	12	93,7
0,5	10,9	4	60,2	15	96,8
0,6	12,9	5	68,4	20	99,0
0,7	14,9	6	74,9	30	99,9

## 12 dBm to miliwats conversion table

dBm	mW	dBm	mW	dBm	mW
-50	0,00001	-6	0,25	3	2,00
-40	0,0001	-5	0,32	5	3,16
-30	0,001	-4	0,40	7	5,01
-20	0,01	-3	0,50	10	10,00
-10	0,10	-2	0,63	12	15,84
-9	0,13	-1	0,79	15	31,62
-8	0,16	0	1,00	17	50,12
-7	0,20	1	1,26	20	100,00

## 13 Calibration, service center

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