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AOMM-FHM2

Optical multimeter

DRAFT VERSION



Operating manual

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Before starting operation of the device

NOTE: *Read this operating manual attentively! It contains important information about installation, ambient conditions and maintenance of the device. Keep this operating manual for future use and for handover in the event of a change of owner. A PDF version of this manual is available to download on the ASTRO website (there may be a more recent version). The ASTRO company confirms that the information in this manual was correct at the time of printing, but it reserves the right to make changes, without prior notice, to the specifications, the operation of the device and the operating manual.*

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Symbols and conventions used

Symbols used in these instructions

Pictograms are visual symbols with specific meanings. You will encounter the following pictograms in this installation and operating manual:



Warning about situations in which electrical voltage and non-observance of the instructions in this manual pose a risk of fatal injuries.



Warning about various dangers to health, the environment and material.



Warning about thermal dangers (risk of burns).



Warning about high laser radiation emitted from a device, connector or adapter (risk of eye damage).



Recycling symbol: indicates components or packaging materials which can be recycled (cardboard, inserts, plastic film and bags). Used batteries must be disposed of at approved recycling points. Batteries must be completely discharged before being disposed.



This symbol indicates components which must not be disposed of with household rubbish being disposed of.

Proper use

The AOMM-FHM2 optical loss test set combines a power meter and a three-wavelength laser source, for optical fibre network installation and maintenance. Misuse of the device may result in electric shock, fire and/or serious personal injury. Modification of the devices or use for any other purpose is not permitted, and will immediately void any guarantee provided by the manufacturer.

Target group of this manual

The target group for installation and starting operation of the ASTRO optical transmission technology are qualified experts who have training enabling them to perform the work required in accordance with EN 60728-11 and EN 62368-1. Unqualified persons are not allowed to install and start operation of the device.

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Important safety information

To avoid any hazardous situations to the extent possible, you must adhere to the following safety information:

ATTENTION: *Failure to observe this safety information may result in personal injury due to electrical and thermal dangers!*

Proper use

- ☐ Only use the device at the approved operating sites and in the ambient conditions allowed (as described in the following), and only for the purpose described in the section "Proper use".

Before starting operation of the device

NOTE: *Read this operating manual attentively! It contains important information about installation, ambient conditions and maintenance of the device. Keep this operating manual for future use and for handover in the event of a change of owner or operator. A PDF version of this manual is available to download on the ASTRO website (there may be a more recent version).*

- ☐ Check the packaging and the device for transport damage immediately. Do not start operation of a device that has been damaged.

Danger of optical radiation

This product is laser class 1M (according IEC 60825-1 Safety of Laser Products) and therefore several safety precautions must be applied.

- ☐ Exposure to class 1M laser radiation is possible on open connectors or connected fibre patch cords. Do not view exposed fibre or connector ends when handling or maintaining optical equipment. Do not view with optical instruments into open connectors or fibre ends on switched on devices. Make sure all wherever a fibre inspection is required, that the inspected fibre or connector is completely optical radiation free.
- ☐ Due to the high optical radiation and improper handling of optical fibre connections and devices, there could be risks for the operating and service personnel. Access should be restricted to trained personnel only.



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- ☐ Never look directly or with optical inspection tools into the end of a fibre which is connected to a transmitter or optical amplifier and which is in operation. If the eyes are exposed to optical radiation, which are above the acceptable maximum, this could cause permanent damage to the eye.

Installation, operation, maintenance

- ☐ The electrical connection conditions must correspond to the specifications on the device type plate.
- ☐ The ambient temperatures specified in the technical data must be complied with, even when climatic conditions change (e.g. due to sunlight). If the device overheats, the insulation used to isolate the mains voltage may be damaged.
- ☐ The device may only be operated away from radiant heat and other sources of heat.
- ☐ To avoid trapped heat, ensure there is good ventilation on all sides.
- ☐ No objects may be placed on the device.
- ☐ The device does not feature protection against water and may therefore only be operated and connected in dry rooms. It must not be exposed to spraying or dripping water, to condensation, or to similar sources of moisture.
- ☐ All adhere to all applicable national safety regulations and standards.
- ☐ The device is operational when connected to the mains power or if the provided Lithium battery is charged and inserted into the battery compartment of the device.
- ☐ Excess mechanical loads (e.g. falling, impacts, vibrations) may damage insulation used to provide protection from mains voltage.
- ☐ High excess currents (lightning strike, surges in the power utility grid) may damage insulation used to provide protection from mains voltage.
- ☐ If there is no information about intended use (e.g. operating site, ambient conditions), or the operating manual does not include the corresponding information, then you must consult the manufacturer of this device to ensure that the device may be installed. If you do not receive any information on this from the manufacturer, do not start operating the device.
- ☐ Do not operate the instrument in the presence of flammable gases or fumes.
- ☐ Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be



made only by qualified service personnel.

- ☐ Stop using the device when it malfunctions. (See section „Maintenance and repair“).
- ☐ Use only the AC adapter / battery charger designed for this device. Using an improper AC power source may cause fuming, electric shock or equipment damage and may result in personal injury, death or fire.
- ☐ Do not disassemble or modify the device, AC adapter or battery. In particular, do not remove or bypass any electrical or mechanical device (e.g. a fuse or safety switch) incorporated into the design and manufacturing of this equipment. Modification could cause damage that may result in personal injury, death, electric shock or fire.
- ☐ Never operate the device in an environment where flammable liquids or vapors exist. Risk of dangerous fire or explosion could result from the splicer's electrical arc in such an environment.
- ☐ Do not use compressed gas or canned air to clean the device. They may contain flammable materials that could ignite during the electrical discharge.
- ☐ Do not modify, abuse, heat or excessively pull on the supplied AC cord. The use of a damaged cord may cause fuming, electric shock or equipment damage and may result in personal injury, death or fire.
- ☐ Do not short-circuit the terminals of AC adapter and optional battery. Excessive electrical current may cause personal injury due to fumes, electric shock and equipment damage.
- ☐ Do not touch the device, AC power cord and AC plugs with wet hands. This may result in electric shock.
- ☐ Do not operate the device near hot objects, in hot temperature environments, in dusty/humid atmospheres or when water-condensation is present on the device. This may result in electric shock or malfunction.
- ☐ Do not store the device in any area where temperature and humidity are extremely high. Possible equipment failure may result.
- ☐ Operating personnel is not allowed to remove instrument covers. Component replacement and internal adjustments must be made only by qualified service personnel.

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Maintenance

- ☐ Read carefully: EN 60728 - Part 1 Safety requirements: No service work during thunderstorms.

Repair

- ☐ Repairs may only be performed by the manufacturer. Improperly performed repairs may result in considerable dangers for the user.
- ☐ If malfunctions occur, the device must be disconnected from the mains and authorised experts must be consulted. The device may need to be sent to the manufacturer.

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Description of performance

The optical multimeter AOMM-FHM2 can operate as an optical power meter or as a laser source.

When operated as an optical power meter, three different modes can be used:

- ☐ **Testing mode:** In this mode you can either use the laser source output of the device to measure the attenuation of cables or splitters or you can use the optical input of the device to measure the incoming optical power.
- ☐ **Reference Setting mode:** In this mode you can first measure a reference value of the optical power for just the cabling between transmitter and receiver. You may then put splitters or attenuators into the signal path. After that you can measure the attenuation of these elements without the influence of the cabling.
- ☐ **History Data mode:** In this mode you can store measured data or recall stored data.

The AOMM-FHM2 features the following performance characteristics:

- ☐ three wavelengths (1310 nm, 1490 nm and 1550 nm) combined in one port
- ☐ the output of laser source stabilizes at -5 dBm
- ☐ laser source supplies CW and modulated 270 Hz, 1 kHz, 2 kHz output
- ☐ laser source transmits wavelength recognition code
- ☐ optical power meter displays linearity and logarithmic optical power values; automatic shifting of measurements in optical power meter
- ☐ automatic wavelength recognition and shifting to the measured wavelength in optical power meter
- ☐ storage of 999 sets of tested data in optical power meter
- ☐ screen backlight
- ☐ rechargeable batteries
- ☐ auto-off at low voltage

- ☐ auto-off after 10 min without operation
- ☐ display of battery capacity

Typical operation:

- ☐ optical power measurements (dBm and W)
- ☐ fibre-link loss testing (dB)
- ☐ insertion loss testing (dB)
- ☐ fibre identification with 270 Hz, 1 KHz, 2 KHz signals
- ☐ fibre installation and maintenance applications
- ☐ FTTx: testing of passive optical networks

Warranty conditions

The general terms and conditions of ASTRO Strobel GmbH apply. You will find these in the current catalogue or on the Internet under "www.astro-kom.de".

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Disposal



All of our packaging material (cardboard boxes, inserts, plastic film and bags) is completely recyclable. Electronic devices must not be disposed of with household waste, but rather – according to DIRECTIVE 2012/19/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL from 4 July 2012, on waste electrical and electronic equipment – must be properly disposed of. When it is no longer of use, please bring the device for disposal to one of the public collection points for this purpose.

ASTRO Strobel is a member of the Elektro system solution for the disposal of packaging materials. Our contract number is 80395.

Device description

Scope of delivery

- ☐ main unit (including batteries)
- ☐ quality check report
- ☐ carrying bag
- ☐ interchangeable FC, SC, ST connector for both power meter and laser source
- ☐ charger / AC adapter
- ☐ PC software
- ☐ USB connecting cable
- ☐ operating manual

CE

The AOMM-FHM2 features a CE marking. This confirms that the product conforms to the relevant CE directives and adheres to the requirements specified therein.

Battery compartment



The battery compartment is located on the rear side of the device. You can open it by turning the black clip upwards. Put in two AA type batteries and lock the clip again.

AOMM-FHM2 - Display



NO.	LED	Description
1	LD	1310nm, 1490nm and 1550nm output port (laser source output port)
2	850/1300/1310/1490/1550/1625nm	Current wavelength tested by the optical power meter
3	REF	Reference value in the optical power meter
4	270Hz 1kHz 2kHz	Modulated frequencies identified by optical power meter
5	SINGLE TWIN	SINGLE: Auto-wavelength recognition of laser source and optical power meter is off. TWIN: auto-wavelength recognition of laser source and optical power meter is on.
6	SAVE 888	Number of the current data in the storage of the optical power meter
7	PD	Input port of optical power meter (optical power meter input port)
8		State of the USB connection
9		External power supplier indicator
10		Signal of battery capacity. Please make the charge when  flashes to show the insufficient battery capacity.The system shut off automatically when the battery capacity is not enough.
11	mw uw dBm	Display of value unit.
12	AUTO-OFF	AUTO-OFF indicator. AUTO-OFF defaults to turn on when the equipment is on.

AOMM-FHM2 - Buttons on the front side



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NO.	Key	Description
1		LED display of wavelength display on laser source
2		LED display of modulated wavelength display of laser source
3		Wavelength shift key on laser source
4		Switch on/ off the auto-recognition mode of laser source and power meter
5		Modulated frequency and CW shift Key on laser source
6		Wavelength shift on optical power meter; in "LOAD" mode, it is to delete the value.
7		Unit-shifting key of optical power meter and page-up key in "LOAD" mode
8		Reference value setting key on optical power meter and display current reference value
9		Load and storage of optical power value
10		Background light key and page-down key in "LOAD" mode
11		ON/OFF key, long-keypress for over 2 seconds to close the auto-off function

Preparing for operation

Unpacking the instrument

We suggest that you keep the original packing material. Using the original packing material is your guarantee of protecting the instrument during transit.

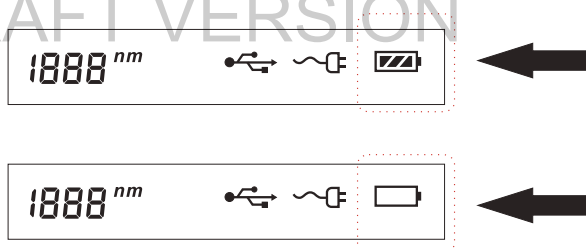
- ☐ Green light: working state or fully charged
- ☐ Red light: charging state

Checking the package contents

After unpacking the instrument, check to see whether it was damaged during transit. This is particularly likely if the outer casing is clearly damaged. If there is damage, do not attempt to operate the instrument or to repair it without authorization. Doing so can cause further damage and you may lose your warranty qualification.

Rechargeable batteries

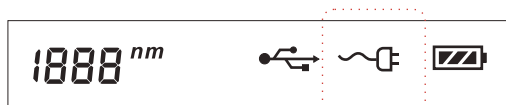
There is a battery indicator on the screen to show if it is charged. There are four states the indicator may show, full, with 2 blacks, with 1 black and empty. An empty battery indicator means there is almost no power left (see pictures below).



When the battery charge is too low to supply the necessary power, the instrument will automatically switch off.

AC adapter operation

There is a DC input jack on the bottom side of the AOMM-FHM2 instrument casing into which the output cable of the AC adapter must be plugged. When the AC adapter is plugged in, the indicator on the LCD will be displayed.

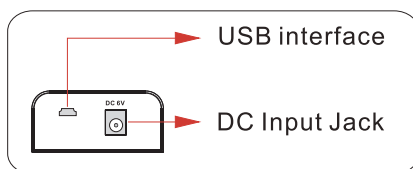


NOTE: Make sure that the operating voltage is within the range of the local AC voltage.
AC adapter supply isn't allowed when dry batteries are used in the instrument!

Getting started

USB interface

You can use the USB interface to connect the instrument to a PC and download the stored data. There is a socket on the bottom side of the instrument right beside the DC input jack (see picture below). The USB cable supplied can be used to connect it to the USB interface of a PC. When the USB cable is connected, the indicator on the LCD screen will be displayed.



Turning the instrument on and off

Press the "ON/OFF" key briefly.

The instrument powers on, and backlighting switches on. Please check the battery capacity if it fails.

Press the "ON/OFF" key briefly again.

The instrument powers off, and backlighting switches off.

Activating the automatic shutdown function

The instrument powers off automatically if there is no key press within 10 minutes. Press the "ON/OFF" key for about 2 seconds to power on the instrument with "auto-off" function deactivated.

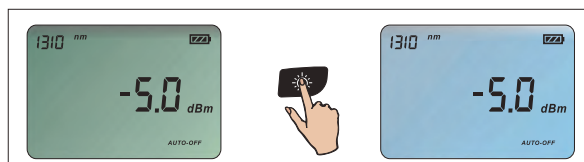
Switching backlighting of the LCD on and off

Press the backlighting key .

Backlighting switches on.

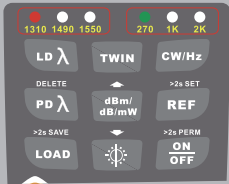
Press the backlighting key  again.

Backlighting switches off (see figure below).

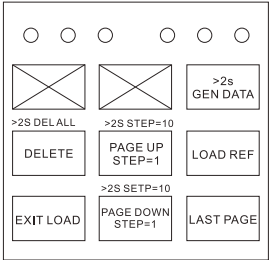


Operating the device

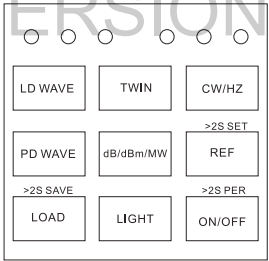
When used as a power meter, the AOMM-FHM2 will measure the optical power or loss and can be operated in three different modes („Testing“, „Reference Setting“ and „History Data“). Depending on the selected mode, the functions of the buttons are as follows:



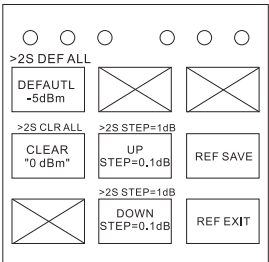
Key definition in History Data Mode

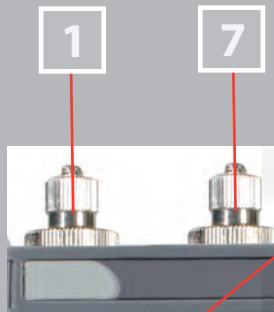


Key definition in Testing Mode



Key definition in Ref. Setting Mode



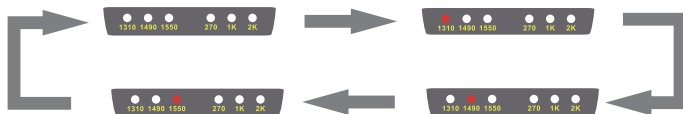


Using the laser source of the device

To use the laser source of the AOMM-FHM2, you must connect the output [7] of the device.

The **LD λ** button can be used for shifting the wavelength of the laser source.

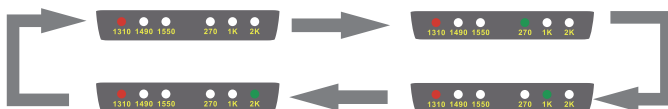
The laser source module defaults to be closed when the user turns on the equipment. Press this button and the wavelength LED of 1310 nm, 1490 nm or 1550 nm will be on circularly or the wavelength LED will be off.



NOTE: It is suggested to turn off the laser source module when it is not needed to save battery power.

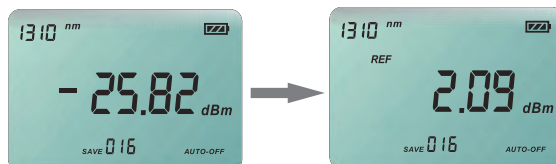
The **CW/Hz** button can be used for shifting the modulated wavelength and CW of the laser source.

When the laser source works on any wavelength of 1310 nm, 1490 nm or 1550 nm, press this button to select the modulation of 270 Hz, 1 kHz and 2 kHz circularly and the LED of the modulated wavelength will be on correspondingly. Pressing the key can also turn off the modulation and shift to the CW.



The **TWIN** button can be used to switch on or off the auto-recognition mode of the power meter and laser source.

Press this button to turn on the auto-recognition mode and "TWIN" will be displayed on the LCD. Press again to turn off the mode.



NOTE: The "TWIN" mode is on or off at the same time in the laser source and power meter modules of the AOMM-FHM2.

It is suggested to turn off the "TWIN" mode when you don't use it. The output of laser source will be fluctuated.

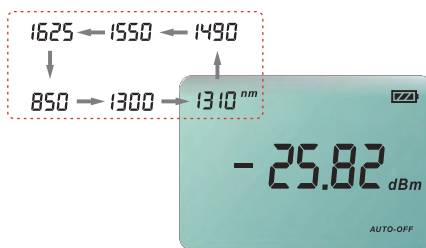
The function of "TWIN" and Modulation cannot work together. When "TWIN" mode is on, the modulation of the laser source module is closed automatically.

Wavelength will be shifted automatically according to the recognition when the "TWIN" mode of the power meter module is on. In words, the modulated signal of 270 Hz, 1 kHz and 2 kHz cannot be recognized and received now.

Operation in „Testing“ mode

„Testing“ is the standard mode of the device. Use the laser source output of the device (as described above) to measure the attenuation of cables or splitters or use the optical input [1] of the device to measure the incoming optical power.

The  button can be used for shifting the wavelength of the power meter module. By pressing this button it is possible to cycle through the different wavelength (1490 nm, 1550 nm, 1625 nm, 850 nm, 1300 nm and 1310 nm, see figure below). The instrument defaults to 1310 nm.



NOTE: The power meter defaults to auto-recognize the modulated signal of 270 Hz, 1 KHz and 2 KHz and displays the signal on the LCD screen. If the signal is CW, no modulated signal will be displayed.

The  button is used to adjust the unit in which the optical power is displayed. The power meter defaults to the unit of "dBm". Press this button to shift to "dB" and "mW".

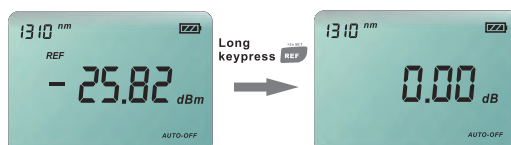


NOTE: "dB" and "mW" are the unit representing the absolute value of the measured power value. If this power value is less than 1 mW in the unit of "mW", the unit will be shifted to "uW" automatically.

"dB" is the relative value of the measured power value. Firstly, the user should set a reference value. Then, the current value can be compared to the reference value. The formula is "dB" value equals to "the reference value" minus "the current power value in dBm".

The  button can be used to set the reference value of the power meter.

The reference value defaults to 0,00 dBm on the optical power meter module. Long press the button for over 2 seconds and the instrument will set the current optical power value as the reference. Short press the key to read the current reference value. The instrument will return to the testing state after two seconds without operation. If there's operation, the instrument will shift to the reference editing state.



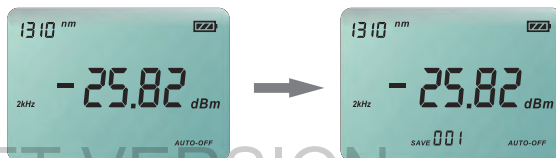
NOTE: If you long press the REV button for over 2 seconds, the unit will be shifted to "dB" automatically. When the input laser power is a modulated laser source, it will affect the setting of the REF value. Please guarantee the input laser source is CW laser when setting the REF value.

The  button can be used for loading and storing measured optical power values.

Long press this button to store the current values including the wavelength, values, modulation, states and units that are being tested. It will list and show the number of the current memory value from "001" to "999" on the LCD.

Short press the button to check the stored data. Press the button again to exit the "history records" mode.

..



Operating in „Reference Setting“ mode

In this mode you can first measure a reference value of the optical power for just the cabling between transmitter and receiver. You may then put splitters or attenuators into the signal path. After that you can measure the attenuation of these elements without the influence of the cabling.

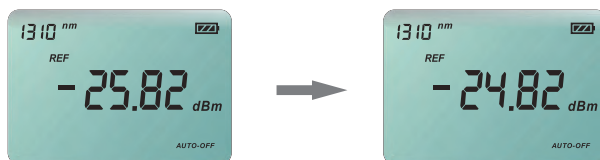
Press the  button for 2 seconds to enter „Reference Setting“ mode.

Short press the "REF" button will check the reference value in the current wavelength. If there is no operation, the instrument will return to the testing state automatically after two seconds. If there is any button press, the instrument will enter the editing state of reference.

The  button can be used for increasing the reference value. Short keypress is to increase the current reference value for 0,1 dB.

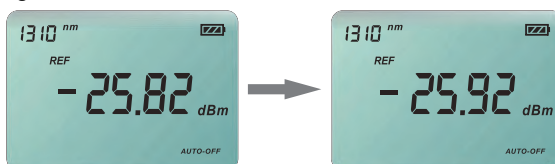


Long press is to increase the current reference value for 1dB.

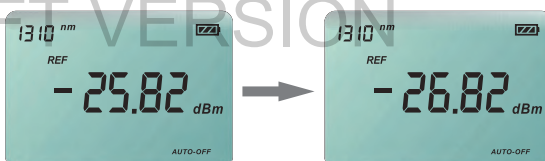


The  button can be used to decrease the reference value.

Short press to decrease the reference value for 0,1 dB in the current wavelength.

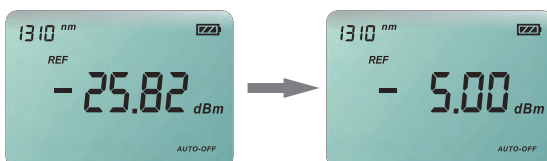


Long press to decrease the reference value for 1 dB in the current wavelength.



The  button can be used to set the reference value to default.

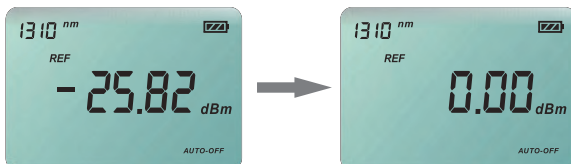
Short press is to set the reference value in the current wavelength to "-5 dBm". Long press to set all the reference values in all wavelengths to "-5 dBm".



NOTE: Setting the reference value to "-5 dBm" means to work with the output "-5 dBm" of the laser source. Then it can test the attenuation of the circuit.

The  button can be used to delete the reference value.

Short press is to delete the reference value in the current wavelength to "0,00 dBm". Long press is to delete all the reference values in all wavelengths to "0,00 dBm".



The  button can be used to store the current reference setting.

Press this button to store the current reference setting in the instrument. The stored data will be saved even when the power is off. The instrument will return to the measuring state and the unit will return to "dB" after the storage. The reference value is displayed but not saved before pressing the "REF" button. No data will be restored if it is not saved by pressing the button before the power is off.

The  button can be used to discard the reference value of the current setting.

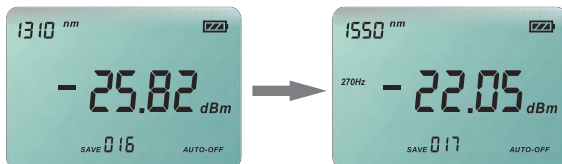
Press this button to discard the reference value of the current setting and all the setting data are not saved. The instrument will return to the original state. It will go back to the measuring state and the unit will be shifted to "dB".

Operating in „History Data“ mode

Use this mode to store and recall measured data. You can enter this mode by pressing the  button.

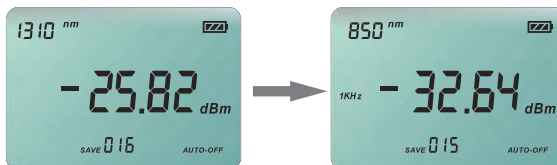
The  button can be used to scroll upwards through the stored data sets, numbered from 001 to 999.

E.G. the current value is saved to number 001, short press to check the stored value numbered 999. Long press for over 2 seconds to check the stored value numbered 990.



The  button can be used to scroll downwards through the stored data sets, numbered from 001 to 999.

E.G. the current value is saved as number 001, short press to check the stored value numbered 002, long press for over 2 seconds to check the stored value numbered 011.



The  button can be used to check the last stored data.

The  button can be used to check the reference value of the current stored data.



The  button can be used to delete the stored data.

Short press to delete the current stored data displayed on the LCD. Then, the next piece of stored data will be displayed on the LCD. If the data deleted is the only data being saved in the storage, the instrument will return to the measuring state.

Press the  button to exit history data mode and return to the measuring state.

Maintenance and repair



ATTENTION: *It is essential that the following safety information be observed when performing maintenance and repair work. Failure to observe this safety information may result in physical injury due to electrical and thermal dangers!*

- ☐ Read carefully: EN 60728 – Part 1 Safety requirements: No service work during thunderstorms.
- ☐ A defective device may only be repaired by the manufacturer to ensure that components with the original specification are used (e.g. power cable, fuse). Improperly performed repairs may result in considerable dangers for the user or installer. If malfunctions occur, the device must therefore be disconnected from the mains and authorised experts must be consulted. The device may need to be sent to the manufacturer.

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Technical data

Type		AOMM-FHM2
Order number		212 203
EAN-Code		4026187210397
Optical Power Meter Specification		
Calibration Wavelength	[nm]	850/1300/1310/1490/1550/1625
Connector		interchangeable FC/SC (ST optional)
Data Storage (items)		999
Ref. Value		Yes
Display Units		dB/dBm/mW/μW
Display Precision	[dB]	0,01
Accuracy	[nW]	± 5 % ± 1,0
Wavelength Recognition	[nm]	1310/1490/1550 (input power ≥ -40 dBm)
Tone Detection	[Hz]	270/1K/2K (input power ≥ -40 dBm)
Measuring Range (optical power)	[dBm]	-50 to +26
Optical Laser Source Specification		
Output Wavelength	[nm]	1310/1490/1550
Connector		fixed FC/PC
Modulation Frequency	[Hz]	270/1K/2K
Output Power	[dBm]	-5 ± 0,5
Stability Long-term (8h)	[dB]	±0,1 @ 1310/1550 nm ; ±0,2 @ 1490 nm
Stability Short-term (15 min)	[dB]	±0,05 @ 1310/1550 nm; ±0,1 @ 1490 nm
Wavelength Recognizing Code		Yes
Auto Power off		Yes
Common data		
Power Supply		2pcs *NiHM 1,2V, ,2000 mAh; AC/DC Adaptor
PC Interface		USB
Battery Life	[h]	>100 (laser off)
Relative Humidity	[%]	< 90 (Non-condensing)
Ambient temperature	[°C]	-10...+50
Storage temperature	[°C]	-20...+7
Weight	[kg]	0,26
Dimensions (W x L x H)	[mm]	76 x 168 x 45

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