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FireFly[®] Power-Over-Fiber Adapter

Enabling Continuous FireFly[®] Operation

Preliminary

Instruction Manual



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Manufacturer

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Warranty

PMK warrants this product for normal use and operation within specifications for a period of one year from date of shipment and will repair or replace any defective product, which was not damaged by negligence, misuse, improper installation, accident or unauthorized repair or modification by the buyer. This warranty is applicable only to defects due to material or workmanship. PMK disclaims any other implied warranties of merchantability or fitness for a particular purpose. PMK will not be liable for any indirect, special, incidental, or consequential damages (including damages for loss of profits, loss of business, loss of use or data, interruption of business and the like), even if PMK has been advised of the possibility of such damages arising from any defect or error in this manual or product.

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Compliance Information

The FireFly® series Power-over-Fiber Adapter complies with the following relevant union harmonization legislation, safety and environmental standards. Only professionals and qualified personnel should use this product. Serious injury or death may occur as result of incorrect usage of this product.

Power-over-Fiber Adapter

- IEC/EN 61010-1:2010 - Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General Requirements
- IEC/EN 60825-1 - Safety of Laser Products Part 1: Equipment Classification and Requirements -Edition 3 (2014)
- US 21CFR Part 1010 - Performance Standards for Electronic Products: General
- US 21CFR Part 1040 - Performance Standards for Light- Emitting Products
- Laser Certification: Class 1 Laser Product
- UN3481 – Product contains a Lithium Polymer battery internally.

This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

CAUTION. Use of controls or adjustments for performance of procedures other than those specified herein may result in hazardous exposure.

Internal Battery



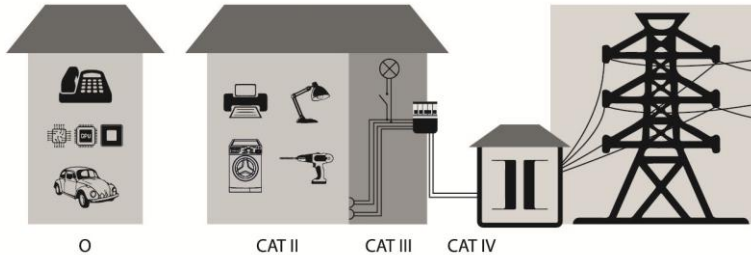
The **FF-POF-A01** Probe Head Adapter contains an internal, non-accessible, non-user-replaceable Lithium Polymer battery. See the Safety and Handling section.

IEC Safety Information

IEC Measurement Categories

This adapter is not rated for any measurement category. Do not use it in environments with measurement category II, III or IV.

Definitions and Examples:



Overview of measurement categories according to IEC 61010-01

O = No Measurement Category (Other circuits that are not directly connected to mains)

IEC Pollution Degree

- Pollution Degree 1** No POLLUTION or only dry, non conductive POLLUTION. NOTE: The POLLUTION has no influence.
- Pollution Degree 2** Only- non conductive POLLUTION. Occasionally, however, a temporary conductivity caused by condensation must be accepted.
- Pollution Degree 3** Conductive POLLUTION occurs or dry, non-conductive POLLUTION occurs which becomes conductive due to condensation which is to be expected.

IEC Safety Symbols

The following symbols may appear on the product or in this instruction manual:



Caution, risk of danger. Refer to manual.



Caution, risk of electric shock.



Earth (ground) TERMINAL.



Laser Class 1

Laser products that are safe during use, including long-term direct intrabeam viewing, even when exposure occurs while using telescopic optics. Class 1 also includes high power lasers that are fully enclosed so that no potentially hazardous radiation is accessible during use (embedded laser product).

Safety and Handling Information

Read this Instruction Manual before first use and keep it for future reference. Read the FireFly® series Instruction Manual as well before first use and keep it for future reference. A digital copy of the latest Instruction Manual revision can be downloaded at www.pmk.de.

The overall safety of any measurement setup incorporating this power adapter is the responsibility of the user. The use is for qualified and trained personnel only.

The Power-over-Fiber Probe Head Adapter is optically isolated/galvanically isolated from the measuring system and earth ground.



To avoid personal injury and to prevent fire or damage to this product or products connected to it, review and comply with the following safety precautions. Be aware that if you use this assembly in a manner not specified, the protection this product provides may be impaired. Only qualified personnel should use this assembly.



Keep away from hazardous live circuits.

Avoid open circuitry. Do not touch connections or components when power is present. Maintain safe clearance from the Probe Head Adapter and Fiber Cable while connected to the FireFly®.

Avoid any unnecessary stress to the adapter like dropping, impacts and strong vibrations.

Do not crush, crimp, twist, pull, jerk or sharply bend the fiber-optic cable. Avoid making loops in the fiber-optic cable smaller than 12.7cm (5in).

Keep products clean and dry.

Remove all connections of the probe head adapter system before cleaning. Keep the fiber cable clean and free from contaminants.

Inspect the fiber cable for dirt, contaminants or damage before each use and clean using a dry, lint-free cloth. If dirt remains, use a soft cloth or swab dampened with a 75% isopropyl alcohol solution and rinse with deionized water. A swab is useful for cleaning narrow spaces; use only enough solution to dampen the swab or cloth. Do not use abrasive compounds on any part of the probe.

Do not use chemical cleaning agents; they may damage the probe. Avoid using chemicals that contain ligroin, benzene, toluene, xylene, acetone, or similar solvents.

Continues on next page.

Safety and Handling Information (Continued)

Do not operate with suspected failures.

Refer to qualified service personnel.

Do not operate in wet or damp conditions.

Condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate the product in an explosive atmosphere.



Connect and disconnect properly.

The circuit-under-test **MUST-BE-DE-ENERGIZED (TURNED OFF)** when handling the FireFly® probe and installing and removing the Power-over-Fiber Probe Head Adapter from the FireFly® probe head.

USE ONLY with PMK's FireFly® optically-isolated probe series.

Avoid applying an input signal to the FireFly® probe without the Power-over-Fiber Probe Head Adapter in the FireFly probe head and the FireFly and Power-over Fiber Adapter energized (powered on and operational).

Use only the originally provided carry case to store or transport the adapter not in use.

Battery Safety and Handling Information



Do not attempt to open, puncture, or disassemble the Power-over-Fiber Probe Head Adapter or battery.



Avoid exposure to fire, water, or extreme temperatures.

Follow local regulations for safe disposal/recycling of electronic devices with Lithium Polymer batteries



When shipping and transporting the Power-over-Fiber Adapter, follow the UN3481 classification.

About FireFly® Power-over-Fiber Adapter

The FireFly® Power-over-Fiber (PoF) Adapter provides an alternative to the standard 18650 battery to enable continuously powering of the FireFly Probe Head. Having the ability to continuously power a FireFly allows it to be used in a Production Line Testing and Automation environment. The FireFly Probe Head power source can be quickly and easily changed between battery and the Power-over-Fiber adapter. The FireFly Probe Head must be de-energized (powered OFF) when swapping these two power options.

The PoF Adapter consist of a Laser Module (transmitter unit) and a Probe Head Adapter (receiver unit). The Laser Module requires a PMK power supply e.g. PS02, PS03 etc. connection.

The Laser Module converts the electrical power to optical power, transmits it over a fiber link and the Probe Head Adapter converts it back to from optical power to electrical power.

The Laser Module and Probe Head Adapter has a separate optical communication link that manages the overall system control and status monitoring. The Laser Module and Probe Head Adapter optical path is continuously monitored by the Laser Module and will provide safety shutdown if there is failure condition such as a broken fiber.

Specifications

Read the Instruction Manual before first use and keep it for future reference. A digital copy of the latest Instruction Manual revision can be downloaded at www.pmk.de.

This adapter comes with 1 year warranty. Do not exceed specifications. This adapter is not rated for CAT II, III or IV.

Electrical Specifications

Electrical specifications¹ that are marked with * are guaranteed, others are typical. Use original PMK power supplies only. See Ordering Information.

Compatibility	For use with PMK's FireFly series ONLY
Power Consumption (Laser Module)	5W Maximum
Internal Battery Type	Protected Lithium Polymer Battery
Laser Certification	Laser Class 1 IEC/EN 60825-1:2014, US 21CFR Part 1010, US 21CFR Part 1040

Notes:

¹ Determined when using a PS-02 power supply at +23°C ambient temperature.

Environmental Specifications

Parameter		Specifications
Temperature Range	Operating	+10 °C to +40 °C ^{1, 2}
	Non-Operating	-20 °C to +60 °C
Maximum Relative Humidity	Operating	5 % to 85 % RH (relative humidity) at up to +40 °C, 5 % to 45 % RH above +40 °C up to +50 °C, non-condensing
	Non-Operating	5 % to 85 % RH (relative humidity) at up to +40° C, 5 % to 45 % RH above +40° C up to +60° C, non-condensing
Maximum Altitude	Operating	3000 m (9843 ft)
	Non-Operating	15000 m (49213 ft)

Notes:

¹ Older FireFly series probes might require a free-of-charge compatibility upgrade in PMK's service center for use in environments above room temperature

² When stacking multiple units only +10°C to +35°C

Physical Specifications

Parameter	Specifications
Weight	740 g (Laser Module & Probe Head Adapter)
Dimensions	Laser Module: 115 x 127.5 x 50.5 mm Probe Head Adapter: 180 x Ø26 mm
Connectors	Secondary/ output: FireFly® Battery Input Primary/ input: 1ch of referring PMK power supply
Cable length	2 m

Dimensions

The dimensional drawing of the Laser Module and Probe Head Adapter are coming soon. If the needed, please contact us via sales@pmk.de

Getting Started

Read the Quick Start Guide, and also Safety and Handling Information, the Specifications and the entire Instruction Manual before first use and keep them for future reference. A digital copy of the latest revision can be downloaded at www.pmk.de

This Power-over-Fiber Adaptor is for trained personal only. The adapter is for use with FireFly® probe series only.

Product Overview

The FireFly® series Power-over-Fiber Adapter, FF-POF-A01, enables continuous operation of PMK's FireFly optically isolated probe head. The Power-over-Fiber Adapter consists of a Laser Module connected to a Probe Head Adapter via a 2m fiber optical cable, which provides complete galvanic isolation between the Laser Module and Probe Head Adapter. The Laser Module requires an external PMK power supply.



The PoF Laser Module (transmitter) is equipped with high-power laser diode component.

It is important to note that these components are sensitive to changes in ambient temperature. To avoid any potential issues and extend the lifespan of the unit, it is essential to ensure that it is installed in a controlled environment. In the event that the laser module is operating outside of its temperature range for an extended period, the PoF transmitter will shut down and the Laser Module status indicator LED will blink alternating between red and blue.

Laser Module (Transmitter Unit)



Probe Head Adapter (Receiver Unit)



Laser Module (Transmitter Unit)

The Laser Module converts electric energy to optical energy that is transmitted to the optically isolated probe head via optical fiber.

Probe Head Adapter (Receiver Unit)

The Probe Head Adapter is inserted into the FireFly battery compartment and secured. Follow the startup sequence below.

Status Indicator Laser Module (Transmitter Unit)

The Status Indicator will illuminate after the Laser Module (Transmitter) is energized.

	Indicator	Status	Action / Information
	Green (or user color) (solid)	Normal operation	Probe connected and switched on. Ready for measurements.
	Green (or user color) (fast glowing)	Ready to use. Waiting or probe	Laser ready. Probe not connected or switched off. Waiting for Probe.
	Yellow (blinking)	Powering up.	Laser powering up and establishing communication.
	Yellow (slow glowing)	Powering up and charging internal energy storage	Wait until starts fast glowing green (or user color).
	Red (blinking)	Fault (Critical)	Alert– system stop! Verify if fiber cable is damaged! Mechanical check of all components. If no damage found, restart the system
	OFF	Not energized or custom color set to “black” (see below)	Verify connection to power supply Verify Probe Control settings
	Blue (solid)	Laser Module in Bootloader Mode	While the Laser Module is in Bootloader Mode, the energy output is shut down and the Probe Head adapter is off.
	Blue (blinking)	Probe Head Adapter in Bootloader Mode	

Status Indicator Probe Head Adapter (Receiver Unit)

The Status Indicator will illuminate after the Laser Module (Transmitter) is energized.

	Indicator	Status	Action / Information
	Green (or user color) (solid)	Normal Operation	Probe connected and switched on. Ready for measurements.
	Green (or user color) (fast glowing)	Ready to use. Waiting or probe	Laser ready. Probe not connected or switched off. Waiting for Probe.
	Yellow (slow glowing)	Powering up and charging internal energy storage	Wait until starts fast glowing green (or user color).
	OFF	Not energized or Switched off or Laser module in Bootloader Mode or custom color set to “white” (see below)	Verify Laser Module: if flashing red = fault if blue = Bootloader Mode if off verify power supply and verify Probe Control settings
	Blue (blinking)	Bootloader Mode	While in Bootloader Mode the Laser Module Indicator will also blink blue.

User Colors

The user can change the normal operation color via the PMK Probe Control software in order to match the color coding of the oscilloscope. Available colors are: “green (default color), red, blue, magenta, yellow, cyan and white”. The also available option “black” turns the LEDs off; no optical status feedback is present!

The color option affects the Laser Module Status Indicator LED as well as the Probe Head Adapter Status Indicator LEDs.

Installation/ Startup Sequence

Installation, handling and use of this product are for trained and qualified personnel only.



WARNING! Do not turn the system on until all connections are made.



Before handling a component of the Power-over-Fiber Probe Head Adapter, make sure the probing system is powered-off, and the circuit-under-test is either de-energized or not connected to the probe.



The power supply pin assignment is different from other power supplies. Use only original PMK power supplies with PMK probes

This is the power supply cable pin assignment:



- 1) **After Storage or transportation:** Connect the FireFly® Power-over-Fiber Adapter's Laser Module (transmitter) to the PMK power supply e.g. PS02, using the supplied PMK Probe Connection Cable. If the ambient temperature is below 25°C, we recommend connecting the PoF adapter to the FF. Do not connect FF and PoF if the ambient temperature is above 25°C.
- 2) Turn on the PMK power supply, the Power-over-Fiber (PoF) system will power up.

The status indicator LED on the PoF Laser Module will shortly flash yellow and then start fast glowing in the user color. If the internal energy storage is full or slow glowing yellow while charging internal storage.

The status indicator LEDs on the PoF Probe Head Adapter will behave in the same manner.

If the PoF system is charging the internal energy storage (slow glow yellow) the energy output at the Probe Head Adapter is shut off, therefore no probe can be turned on. Please wait until the storage is full indicated by the fast glowing green (user color default) LED.

After status LED indicates battery full (green fast glowing) it is good practice to wait at least 30 minutes before inserting the Probe Head Adapter into the Fire Fly probe.
- 3) **After charging** (indicator LEDs on the PoF Probe Head Adapter fast glowing green (>25°C):

Insert the Power-over-Fiber Probe Head Adapter into the FireFly® Probe Head and secure it by rotating the threaded portion only and tightening it. Be careful to only rotate the threaded section and not twisting the fiber assembly. Before insertion as best practice and recommendation, the Firefly Probe Head should already be at ambient temperature of the measurement environment.
- 4) **Connect the FireFly® Interface Box** (attached to oscilloscope's BNC input) to the PMK power supply with a PMK Probe Connection Cable and push the power on button to start the probe.
- 5) The status indicator LED on the PoF Laser Module and on the PoF Probe Head Adapter will light solid in user color.
- 6) The FireFly Interface Box Battery Level Indicators will light to indicate PoF Probe Head Adapter internal energy storage charge level.
- 7) If the battery level shows less than 1 LEDs or if the FireFly probe does not start at all, **detach the PoF Probe Head Adapter** (receiver) from the FireFly Probe Head and repeat the "After Storage or Transportation (Step 1).
- 8) After successful start up, follow the FireFly® series Instructions for setting up the measurement setup.



Scope of Delivery

The FF-POF-A01 FireFly Power-over-Fiber Adapter requires one output of the PMK Power Supplies, e.g. PS02/03. See Ordering Information if you need another power supply with more outputs. The following accessories are included in the scope of delivery.

- **FF-POF-A01** FireFly® Power-over-Fiber adapter for 2m FireFly version
- **890-520-900** Power supply cable (0.6 m)
- Instruction Manual
- Quick Start Guide

Ordering Information

A PMK power supply is required for using the system.

The power supply pin assignment is different from other power supplies. Use only original PMK power supplies with PMK products.

FF-POF-A01 FireFly® Power-over-Fiber adapter for 2m FireFly version

889-09V-PS2 PS-02 (2 channels, with USB interface for remote control)

889-09V-PS2-L PS-02-L (2 channels, with LAN and USB interface for remote control)

889-09V-PS3 PS-03 (4 channels, with USB interface for remote control)

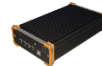
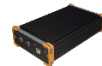
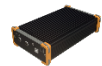
889-09V-PS3-L PS-03-L (4 channels, with LAN and USB interface for remote control)

889-09V-PS6 PS-06 (8 channels, with USB interface for remote control)

889-09V-PS6-L PS-06-L (8 channels, with LAN and USB interface for remote control)

890-520-900 Power supply cable (0.6 m), included in scope of delivery

890-520-915 Power supply cable (1.5 m)



Observe Connector Pin-Out
for PMK power supply cables



Troubleshooting

The following list should help with troubleshooting the PoF module by providing solutions to potential problems.

- The transmitter unit blinks red/blue. System error, possible causes (one or multiple might apply):
 - Overtemperature of transmitter unit; laser temperature is too high, the laser was turned off to prevent damage, return transmitter unit to specified temperature conditions before turning it on again
 - Overtemperature of receiver unit; receiver unit diode temperature too high, the laser was turned off to prevent damage, return receiver unit to specified temperature conditions before turning it on again
- The transmitter unit blinks red/white. Fiber break detected; the laser fiber hardware is likely damaged, de-energize the transmitter unit and verify mechanical integrity of the system on again and send it to PMK for repair
- **After connecting the system to the power supply, the transmitter LED briefly blinks yellow and then turns off.** The PoF module user color might be set to black/off, which turns off the LED while the system is waiting ready to supply power or actively supplying power to a FireFly probe. Note: when the color is set to black, the FireFly on/off state cannot be determined from the PoF module's LED pattern (see status indicator tables above). The color can be changed to one of the seven other user colors using PMK Probe Control.
- **After turning on FireFly in an environment with > 40°C ambient temperature, the FireFly's status indicator starts blinking red.** PMK's PoF module for FireFly is only able to operate at up to 40°C ambient temperature.
- **After turning on FireFly in an environment with < 10°C ambient temperature, the FireFly's status indicator starts blinking red.** PMK's PoF module for FireFly is only able to operate above 10°C ambient temperature.

Notes

[illegible]



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