

Made to measure

SHORT DESCRIPTION FOR THE

FOM-02M

FIBEROPTOMETER



Version 1.1
npi 2015

1. Safety Regulations

VERY IMPORTANT: Instruments and components supplied by npi electronic are NOT intended for clinical use or medical purposes (e.g. for diagnosis or treatment of humans), or for any other life-supporting system. npi electronic expressly disclaims any warranties for such purpose. Equipment supplied by npi electronic shall be operated only by selected, trained and adequately instructed personnel. For details please consult the GENERAL TERMS OF DELIVERY AND CONDITIONS OF BUSINESS of npi electronic, D-71732 Tamm, Germany.

- 1) **GENERAL:** This system is designed for use in scientific laboratories and should be operated by trained staff only. General safety regulations for operating electrical devices are to be considered.
- 2) **AC MAINS CONNECTION:** While working with the npi systems, always adhere to the appropriate safety measures for handling electronic devices. Before using any device please read manuals and instructions carefully.
The device is to be operated only at 115/230 Volt 60/50 Hz AC. Please check for appropriate line voltage before connecting any system to mains.
Always use a three-wire line cord and a mains power-plug with a protection contact connected to ground (protective earth).
Before opening the cabinet disconnect mains power-plug.
Disconnect mains power-plug when replacing the fuse or changing line voltage. Replace fuse only with an appropriate specified type.
- 3) **STATIC ELECTRICITY:** Electronic equipment is sensitive to static discharges. Some devices such as sensor inputs are equipped with very sensitive FET amplifiers, which can be damaged by electrostatic charge and must therefore be handled with care. This can be avoided by touching a grounded metal surface when changing or adjusting sensors. **Always turn power off when adding or removing modules, connecting or disconnecting sensors, headstages or other components from the instrument or 19" cabinet.**
- 4) **TEMPERATURE DRIFT / WARM-UP TIME:** All analog electronic systems are sensitive to temperature changes. Therefore, all electronic instruments containing analog circuits should be used only in a warmed-up condition (i.e. after internal temperature has reached steady-state values). In most cases a warm-up period of 20-30 minutes is sufficient.
- 5) **HANDLING:** Please protect the device from moisture, heat, radiation and aggressive chemicals.
- 6) **SPECIAL WARNING:** THIS INSTRUMENT HAS A HIGH POWER OPTICAL OUTPUT.

2. Special Safety Notice for Instruments with high optical irradiation



**HIGH OPTICAL IRRADIATION!
RISK TO EYES AND SKIN!**

Observe extreme caution when working with this instrument!

- 1) Always attach the provided plug to the fiber output, if the fiber is not connected.
- 2) Collimated light emitted from the unit does pose a potential risk to eyes and skin if viewed directly or skin is left exposed to the light.
- 3) Protect your eyes and skin from fiber output and collimator output.
- 4) Do not wear any reflective items like watches or rings when working with the instrument.
- 5) Servicing should be only done by qualified personnel aware of the hazards!
- 6) If in doubt, return to supplier for servicing!

3. EPMS-07 Modular Plug-In System

3.1. General System Description / Operation

The npI EPMS-07 is a modular system for processing of bioelectrical signals in electrophysiology. The system is housed in a 19" rackmount cabinet (3U) has room for up to 7 plug-in units. The plug-in units are connected to power by a bus at the rear panel.

The plug-in units must be kept in position by four screws (M 2,5 x 10). The screws are important not only for mechanical stability but also for proper electrical connection to the system housing. Free area must be protected with covers.

3.2. EPMS-07 Housing

The following items are shipped with the EPMS-07 housing:

- ✓ EPMS-07 cabinet with built-in power supply
- ✓ Mains cord
- ✓ Fuse 2 A / 1 A, slow (inserted)
- ✓ Front covers

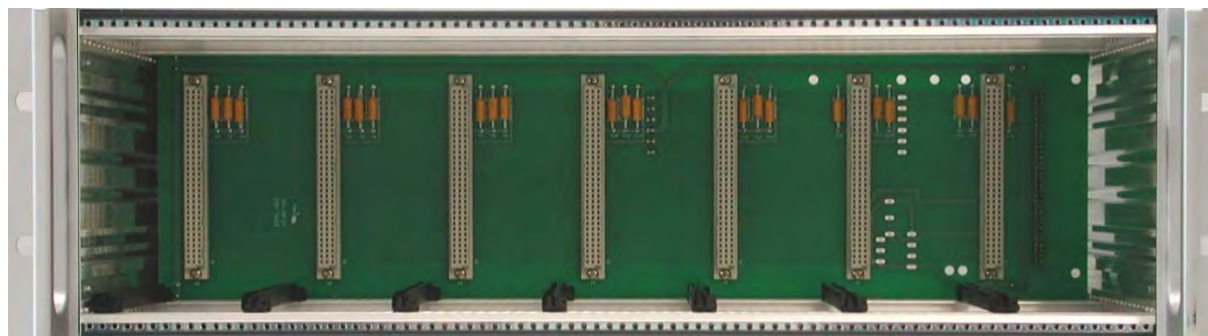


Figure 1: Left: front view of empty EPMS-07 housing.

In order to avoid induction of electromagnetic noise the power supply unit, the power switch and the fuse are located at the rear of the housing (see Figure 2, right).

3.3. EPMS-H-07 Housing

In addition to the standard power supply of the EPMS-07, the EPMS-H-07 has a built-in high voltage power supply. This is necessary for all MVCS / MVCC modules, the HVA-100, HV-TR150 and HVC-03M modules. The output voltage depends on the modules in use.

3.4. EPMS-E-07 Housing

The following items are shipped with the EPMS-E-07 housing:

- ✓ EPMS-E-07 cabinet
- ✓ External Power supply PWR-03D
- ✓ Power cord (PWR-03D to EPMS-E-07)
- ✓ Mains chord
- ✓ Fuse 1.6 A / 0.8 A, slow (inserted)
- ✓ Front covers

The EPMS-E-07 housing is designed for low-noise operation, especially for extracellular and multi channel amplifiers with plugged in filters. It operates with an external power supply to minimize distortions of the signals caused by the power supply.

3.5. EPMS-03

The following items are shipped with the EPMS-07 housing:

- ✓ EPMS-07 cabinet with built-in power supply
- ✓ Mains cord
- ✓ Fuse 034 A / 0,2 A, slow (inserted)
- ✓ Front covers



Figure 2: Left: front view of EPMS-03 housing. Right: rear panel detail of EPMS-03 and EPMS-07 housing.

In order to avoid induction of electromagnetic noise the power supply unit, the power switch and the fuse are located at the rear of the housing (see Figure 2, right).

3.6. PWR-03D

The external power supply PWR-03D is capable of driving up to 3 EPMS-E housings. Each housing is connected by a 6-pole cable from one of three connectors on the front panel of the PWR-03D to the rear panel of the respective EPMS-E housing. (see Figure 3, Figure 4). A POWER LED indicates that the PWR-03D is powered on (see Figure 3, left). Power switch, voltage selector and fuse are located at the rear panel (see Figure 3, right).

Note: The chassis of the PWR-03D is connected to protective earth, and it provides protective earth to the EPMS-E housing if connected.

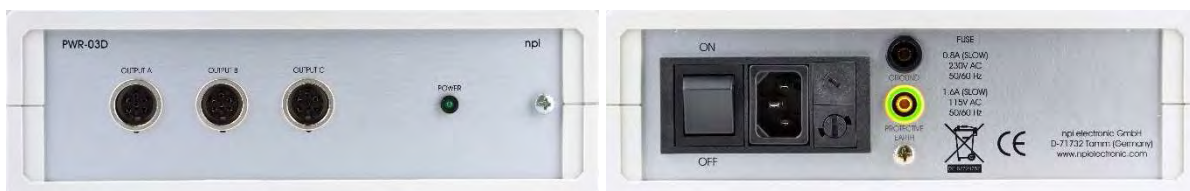


Figure 3: Left: PWR-03D front panel view. Right: PWR-03D rear panel view.

Note: This power supply is intended to be used with npi EPMS-E systems only.

3.7. System Grounding

EPMS-07/EPMS-03

The 19" cabinet is grounded by the power cable through the ground pin of the mains connector (= protective earth). In order to avoid ground loops the internal ground is isolated from the protective earth. The internal ground is used on the BNC connectors or GROUND plugs of the modules that are inserted into the EPMS-07 housing. The internal ground and mains ground (= protective earth) can be connected by a wire using the ground plugs on the rear panel of the instrument. It is not possible to predict whether measurements will be less or more noisy with the internal ground and mains ground connected. We recommend that you try both arrangements to determine the best configuration.

EPMS-E-07



The 19" cabinet is connected to the CHASSIS connector at the rear panel. It can be connected to the SYSTEM GROUND (SIGNAL GROUND) on the rear panel of the instrument (see Figure 4).

The chassis can be linked to PROTECTIVE EARTH by connecting it to the PWR-03D with the supplied 6-pole cable **and** by interconnecting the GROUND and PROTECTIVE EARTH connectors on the rear panel of the PWR-03D (see Figure 3). Best performance is generally achieved without connection of the chassis to protective earth.

Important: Always adhere to the appropriate safety measures.

Figure 4: Rear panel connectors of the EPMS-E-07

3.8. Technical Data

EPMS-07, EPMS-E-07 and EPMS-H-07

19" rackmount cabinet, for up to 7 plug-in units

Dimensions: 3U high (1U=1 3/4" = 44.45 mm), 254 mm deep

EPMS-07 and EPMS-H-07

Power supply: 115/230 V AC, 60/50 Hz, fuse 2 A / 1 A slow, 45-60 W

EPMS-E-07

External power supply (PWR-03D) 115/230 V AC, 60/50 Hz, fuse 1.6/0.8 A, slow

Dimensions of external power supply: (W x D x H) 225 mm x 210 mm x 85 mm

EPMS-03

Power supply: 115/230 Volts AC, 60/50 Hz, fuse 0.4 A / 0.2 A slow

Maximum current supply: 500 mA

Dimensions: 3U high (1U=1 3/4" = 44.45 mm), 254 mm deep, 265 mm wide

4. System Description

The FiberOptoMeter FOM-02M is a module for npi's EPMS-07 modular system. It can be used for fiber coupled optical stimulation with two different wavelengths and fluorescent recordings through the same fiber. The fiber is connected with a FC/PC connector.

Channel A controls a blue LED (470 nm) and channel B controls a green LED (565 nm). The FiberOptoMeter LED channels work independently and can be controlled in three different modes: CONT, TTL and ANALOG:

- **CONT:** the LED of the respective channels is continuously on, the output power is set with the ANALOG 10-turn potentiometers
- **TTL:** the LED is controlled by the TTL inputs: a TTL HIGH signal switches the LED on. The output power is set with the ANALOG 10-turn potentiometers.
- **ANALOG:** the LED is controlled by an analog input voltage at the ANALOG IN BNC connector. Input range is 0 ... 1 V.

The output of the internal photodetector is provided at the OUTPUT BNC connector. Range is -1 ... 0 V.

5. References

Fuhrmann F, Justus D, Sosulina L, Kaneko H, Beutel T, Friedrichs D, Schoch S, Schwarz MK, Fuhrmann M, Remy S.: Locomotion, Theta Oscillations, and the Speed-Related Firing of Hippocampal Neurons Are Controlled by a Medial Septal Glutamatergic Circuit. **Neuron**. 2015 Jun 3;86(5):1253-64. doi: 10.1016/j.neuron.2015.05.001

Stroh A, Adelsberger H, Groh A, Rühlmann C, Fischer S, Schierloh A, Deisseroth K, Konnerth A.: Making waves: initiation and propagation of corticothalamic Ca²⁺ waves in vivo. **Neuron**. 2013 Mar 20;77(6):1136-50. doi: 10.1016/j.neuron.2013.01.031.

Adelsberger H, Grienberger C, Stroh A, Konnerth A.: In vivo calcium recordings and channelrhodopsin-2 activation through an optical fiber. **Cold Spring Harb Protoc**. 2014 Oct 1;2014(10):pdb.prot084145. doi: 10.1101/pdb.prot084145.

6. Technical Data

CHANNEL A:

LED wavelength	470 nm
excitation filter	472 nm (30 nm)

Dichroic A:

Split wavelength	500 nm
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CHANNEL B:

LED wavelength	565 nm
excitation filter	561 nm LP

Dichroic B:

Split wavelength	550 nm
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Detector

Filter wavelength	520 nm (36 nm)
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