



## NuPOE-M16EL OVERVIEW

NuPOE-M16EL is a chassis especially designed for built-in Power over Ethernet load modules, and it could support up to 16 modules per chassis and be structured as a chain of chassis to test more PSE ports at a time.

It offers a prompt and flexible interface to test and monitor different Ethernet power sourcing equipment.

NuPOE-M16EL provides the capability to perform the PoE tests while supporting network traffic tests at the same time by bypassing the data to the traffic tester.

### Key Features

- Specialized equipment for production testing of PSE switch device.
- Support structure of chassis chain.
- Load operation in constant power mode.
- Support Alternative A or B POE wiring mode.
- Support all 5 PD classes (0~4) of power level.
- Emulate PD Connect, Disconnect, Overload, Short Circuit and Dynamic Loading tests.
- Great loading capacity for each port.
- Support up to 45 Watt for loading & overload tests.
- IEEE802.3af and IEEE802.3at compliant.
- Support LLDP.
- PoE Test Procedure:
  - PD Detection Test
    - Decide whether the terminal is PoE compatible
    - Test Detection Voltage
  - PD Classification Test
    - Signature ranges
    - Voltage range
    - Classification Timing
  - Power-up Test
    - Inrush current limit and time
    - Turn-off voltage and time
  - Power loading Test
    - Support short circuit test
    - Support overload test
    - Support dynamic loading test
  - PSE Disconnection Test

### BENEFITS

- Robust design and abundant ventilation for high power PoE testing requirements
- Direct measurements of power, current, voltage, rise time, duration, signaling behavior, and other physical and signaling protocol related parameters.
- Up to 16 PSE ports on chassis.
- Load capacity is up to 45 Watt/port continuously.
- Provide the integrated testing solution for PSE correlated tests
- Rackmount size and able to be structured as a chassis chain for test of mass production.
- Comply with ongoing IEEE 802.3at standard that transmit high power via network cable for device with higher power consumption.



### MAIN APPLICATIONS

- Measurements for PSE Basic parameters
- PSE conformance test
- PSE interoperation test
- Fast, simple, and effective test program used in production lines



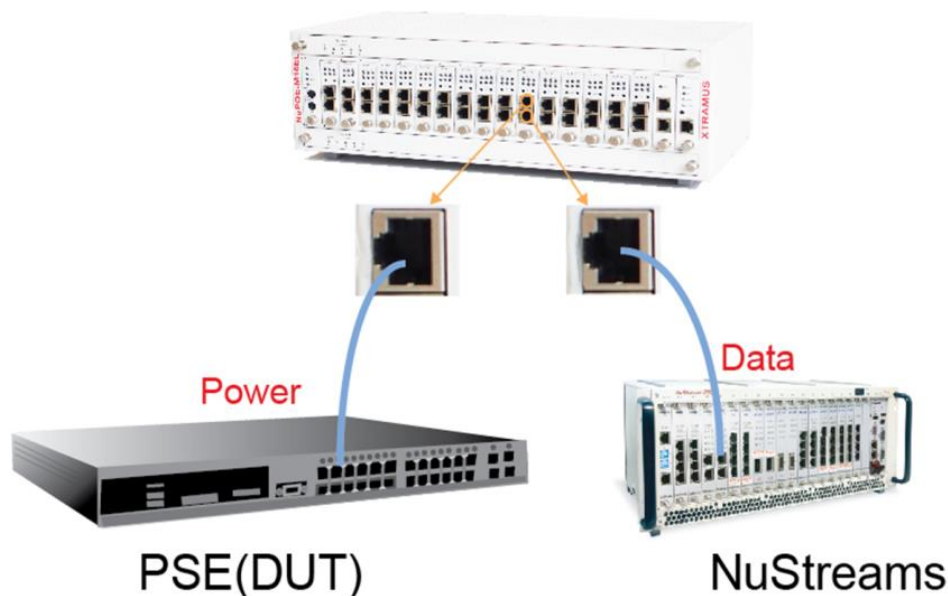
## SPECIFICATIONS

Model Name	NuPOE-M16EL	
Interfaces	Ethernet: RJ45 connector	Power: Male IEC 320 receptacle
Ethernet Speed	Support 10/100/1000 Mbps	
Standard	IEEE 802.3-2005 Clause 33 (IEEE802.3af), IEEE802.3at	
PoE Tests	<div><div>➤</div>PD Detection Test</div> <div><div>➤</div>PD Classification Test</div> <div><div>➤</div>Power-up Test</div> <div><div>➤</div>PD Disconnection Test</div>	
Hardware Information		
Dimension	441 mm x 310 mm x 88 mm	
Temperature*	Operating: 0°C~ 40°C (32°F~ 104°F)	Storage: 0°C~ 50°C (32°F~ 122°F)
Humidity	Operating: 0% ~ 85% RH(non-condensing)	
Power Source	AC 100 to 240 V, 47 to 63 Hz	
Supporting Softwares		
NuApps-MultiUnits-RM: a customizable solution that enables manufactures to perform highly reliable and accurate mass production and quality assurance tests at wire speed during the manufacturing process.		

**Note:** If the NuPOE-M16EL reaches 65 -70°C, the test task will stop, please reactivate your test task after 10-20 seconds when the fan tray cooled your NuPOE-M16EL to below 65°C. If the NuPOE-M16EL reaches 100°C, the system will shutdown automatically, please reactivate your NuPOE-M16EL after it cools down to the room temperature.

## APPLICATION DIAGRAM

Below is the illustration to test network traffic and PoE parameters of the PSE DUT simultaneously. NuPOE-M16EL acts as a PD that processes the PoE tests and also can bypasses the data flow to Packet Generator such as NuStream-2000i for network traffic analysis.





## TECHNICAL TERMS

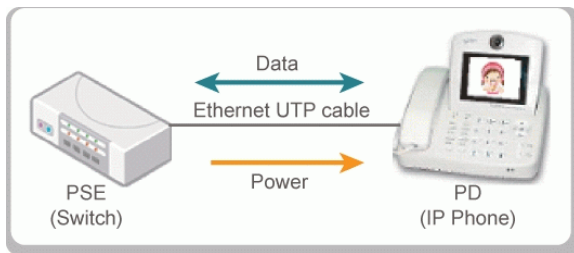
**Power over Ethernet** or PoE technology (commonly referred to as IEEE 802.3af) describes a system to transfer electrical power, along with data, to remote devices over standard twisted-pair cable in an Ethernet network. This technology is useful for powering IP telephones, wireless LAN access points, and other appliances where it would be inconvenient, expensive (mainly wiring problem) or infeasible to supply power separately. PoE includes two devices.

### PSE (Power Sourcing Equipment)

Power Sourcing Equipment is a device (switch or hub for instance) that will provide power in a PoE structure. Maximum allowed continuous output power per such device in IEEE 802.3af is 15.40 W.

### PD (Powered Device)

A powered device is a device powered by a PSE and thus it consumes energy. Examples include wireless access points, IP (video) Phones, and IP cameras. The IEEE 802.3af standard specifies a maximum power usage of 12.95W. NuPOE-M16EL is a kind of PD for loading test.



### Power Class (Level)

In order to know how much power consumption does the PD needs, when PSE detect the PD, this feature allows the PD to indicate its power requirements by changing the sense resistance at higher voltages. Thus, the PSE knows what power class does the PD uses. Power Class of NuPOE-M16EL is tunable for the test.

#### Power level available

Class	Usage	Maximum Power Levels at Input of Powered Device [Watt]
0	Default	0.44 to 12.94
1	Optional	0.44 to 3.84
2	Optional	3.84 to 6.49
3	Optional	6.49 to 12.95
4	Reserved	(PSEs classify as Class 0)

### Endspan and Midspan

Endspan PSEs are Ethernet Switches that include the Power over Ethernet transmission circuitry. Endspan PSEs are commonly called PoE switches. Midspan PSEs are power injectors that stand between a regular Ethernet switch and the powered device, injecting power without affecting the data.

NuPOE-M16EL is able to test these two kinds of devices

### Alternative Mode

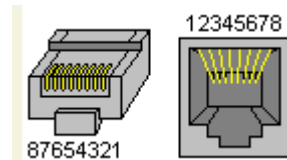
Ethernet UTP network cable has 4 twisted pairs (8 totally) copper wires inside. PSE should provide Mode A and B that define the pairs of power transmission. The mode that is used finally is up to PSE after the PSE detect the status what PD use. For NuPOE-M16EL (PD), it provides two modes for the test from PSE.

A (Power via Pin 1, 2, 3, 6) - Mode A

B (Power via Pin 4, 5, 7, 8) - Mode B

RJ45 Pin #	Wire Color (T568A)	Wire Diagram (T568A)	10Base-T Signal 100Base-TX Signal	PoE
1	White/Green		Transmit+	Mode A +
2	Green		Transmit-	Mode A +
3	White/Orange		Receive+	Mode A -
4	Blue		Unused	Mode B +
5	White/Blue		Unused	Mode B +
6	Orange		Receive-	Mode A -
7	White/Brown		Unused	Mode B -
8	Brown		Unused	Mode B -

Pin location of RJ-45 connector and its socket



New technique is used so that the powered pairs can also carry data. This permits its application not only with 10BASE-T and 100BASE-TX, which use only two of the four pairs in the cable, but also with 1000BASE-T (Gigabit Ethernet) and 10GBASE-T Ethernet, which uses all four pairs for data transmission.

### Stages of PoE link

To create a link that PSE provides power to PD, the stages below is required.

Stage	Action	Volts
Detection	PSE measure whether powered device has the correct signature resistance of 15–33 kΩ	2.7-10.0
Classification	PSE measure which power level class does the PD resistor indicates	14.5-20.5
Startup	Where the powered device will startup	>42
Normal operation	Supply power to device	36-57

### IEEE 802.3at

IEEE 802.3at is commonly referred as PoE+. The standard describes extending the IEEE Power over Ethernet by using two pairs of wires in standard Ethernet Category 5 cable to provide at least 24W of power. NuPOE-M16EL support ongoing IEEE 802.3at standard such as:

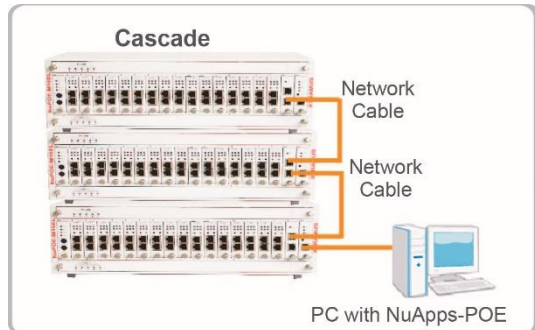
- Follow the power safety rules and limitations pertinent to 802.3af
- Backward compatible with 802.3af PSE.



## Hardware Configuration

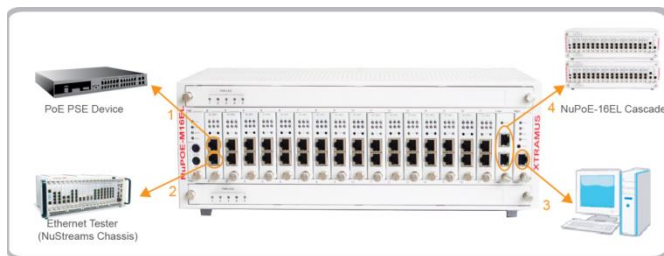
### Chassis Chain

Several NuPOE-M16EL can be cascaded and controlled by one PC for test of more PSE ports.



### Test Data Flow and PoE Simultaneously

Xtramus has total solution to test the PSEs in both data flow and PoE parameters simultaneously. Each module on NuPOE-M16EL has 2 ports as a pair. When the PSE connect to the PD module by port 1 shown in the below graph, the data flow bypasses the module to port 2 for the test from other tester such as NuStreams Chassis. Xtramus' smart software(NuApps-MultiUnits-RM), can run both data flow and PoE tests sequentially or simultaneously.



### PD Module with Power Consumption of 45 Watt

The PD module (XL-T451) supports up to 45 Watt.

## OPERATION OF NuPOE-M16EL

There is no control button on NuPOE-M16EL, and all operation can be done by software that is executed in Windows system. PC that runs the software controls the NuPOE-M16EL via network cable with RJ-45 connector. There are two kinds of software from Xtramus can do PoE tests, NuApps-MultiUnits-RM and 2019 APPS-PoE.

### NuApps-MultiUnits-RM:

NuApps-MultiUnits-RM is a Multi Units Windows UI software of NuStreams chassis platform for all-purpose mass production test. All tests of network device can be pre-configured and arranged in sequence. Accurate and real-time reports present the status of the DUT in all aspects.

Combined with the NuStreams chassis platform, NuPOE-16EL the PD modules can perform the PoE tests and network traffic tests together by using the data bypassing function stated above.

### 2019 APPS-PoE

2019 APPS-PoE is a Windows UI software for NuPOE-M16EL. 2019 APPS-PoE can do the complete PoE conformance tests on the PSEs by emulating all PD conditions.

**Compared with NuApps-MultiUnits-RM, which usually provides simple and fast tests for production lines, 2019 APPS-PoE usually provides more detailed conformance test.** By the multi-port co-operation, it can test some certain limitation settings of PSE, such as the number of the power supply ports at the same time, the max power supplied and so on. But 2019 APPS-PoE is not applicable for production line tests.

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