

## PoE Classification And Powering Option

What are the different PoE Classes?

The table below lists the classes and their power ratings as specified by the IEEE 802.3 AF standard.

CLASS	P <sub>MIN</sub>	P <sub>MAX</sub>	I <sub>CLASS</sub> (MIN)	I <sub>CLASS</sub> (MAX)	R <sub>CLASS</sub>
0	0.44 W	15.4 W	0 mA	4 mA	Open
1	0.44 W	3.84 W	9 mA	12 mA	150 Ω
2	3.84 W	6.49 W	17 mA	20 mA	82.5 Ω
3	6.49 W	15.4 W	26 mA	30 mA	53.6 Ω
4	Reserved	Reserved	36 mA	44 mA	38.3 Ω

Design engineers have a considerable amount of flexibility in selecting power levels within the specifications of both the IEEE 802.3af and 802.3at versions of the PoE standard. IEEE 802.3af specifies four classes, 0 through 3, and IEEE 802.3at adds a fifth class, all relating to different power levels that will be made available. Classification for a particular device is negotiated at the time of the initial connection (*see the table*).

IEEE 802.3AT CLASSES				
Class	Usage	Classification current (mA)	Power range (W)	Class description
0	Default	0 to 4	0.44 to 12.94	Classification unimplemented
1	Optional	9 to 12	0.44 to 3.84	Very low power
2	Optional	17 to 20	3.84 to 6.49	Low power
3	Optional	26 to 30	6.49 to 12.95	Mid power
4	Valid for 802.3at (Type 2) devices, not allowed for 802.3af devices	36 to 44	12.95 to 25.50	High power

Under IEEE 802.3af, the PSE has the option of performing a classification or not. The PD, however, must provide a valid class if the PSE presents the class voltage. A PD will provide a class 0 signature by presenting a 25k resistor, the same resistor value used for detection. Therefore, a Type 1 PD doesn't need to do anything special to comply with classification.

Some form of classification is required for the PSE under IEEE 802.3at. To accomplish that, a concept called mutual identification was introduced. Essentially, both the PD and the PSE are aware of the capabilities of the other end.

PSEs have two ways to classify a PD and are free to use either. The first is the hardware-based method where a specific resistance is presented when the PSE presents the classification voltage. The other is software-based and uses the Link Layer Discovery Protocol (LLDP). Since it requires layer 2 access, it is only available for endspans. (By definition, midspans only inject power and do not interact with the data stream.) The PD must support both, which means all PDs must have a 13-W mode after boot so it can perform LLDP negotiation.

Mutual ID begins when the PSE performs LLDP and receives confirmation that the PD is a Type 2. Conversely, the PD now knows it has a Type 2 PSE. Alternatively, the PSE can present a two-finger class waveform that has been defined in the standard. The PD presents Class 4 to each of the class cycles. The PSE knows it is interacting with a Type 2 PD because it has identified two consecutive Class 4 classifications. The PD knows it has a Type 2 PSE because it saw detection and then two fingers of classification.