

Remote powering standards

There has been a lot of ongoing liaison between TIA TR 42.7 and the IEEE 802.3at task group about the heating effect of cables.

For this issue's column I wanted address a topic that is of renewed interest in the industry, namely how much power can be delivered over 100 ohm balanced twisted pair cabling without overheating the cable?

There is a need to deliver more than the 12.95 watts that is currently specified in the IEEE 802.3af Power over Ethernet (PoE) standard.

The revised objective of the IEEE 802.3at task group that is developing the next generation PoE Plus standard is to deliver a minimum of 24 watts to the powered device, and potentially up to 60 watts, depending on the number of pairs that are energized (2 pairs or 4 pairs), the type of cables and the heating effect of the cables.

A fundamental objective of the IEEE 802.3at standard is continued compliance to the limited power source and SELV requirements as defined in ISO/IEC 60950 Standard for Information Processing and Business Equipment.

SELV stands for Safety Extra Low Voltage. An SELV circuit is so designed and protected that, under normal and single fault conditions, its voltages do not exceed a safe value between any two points of the circuit or to earth.

The output voltage and the maximum current that is specified for the Power Sourcing Equipment (PSE) in the draft IEEE 802.3at standard is shown in Table 1.

	V DC min	V DC max	I _{max}	PSE Power (VA)
Type 1 operation:	44	57	0.35 A	15.4 Watts
Type 2 operation:	50	57	0.6 A	30 Watts

Table 1 - Power Sourcing Equipment output parameters

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At our last meeting, TIA TR 42 has approved a new project to develop a Telecommunications Systems Bulletin (TSB) to support power delivery over balanced twisted-pair cabling. In addition to the transmission requirements, the TSB will cover various installation scenarios and how these may impact the capability of telecommunications cabling to support power delivery.

Let's get back to the question I asked at the beginning of

this article: How much power can be delivered over 100 ohm balanced twisted pair cabling without overheating the cable?

A number of heating experiments have been performed by various cable manufacturers as well as some modeling work to answer this question.

The heating experiments were performed on densely packed cables by measuring the temperature rise in the center of a cable bundle with all the cables energized.

No. of Pairs Energized	Temperature Rise (deg C)	
	Category 5e	Category 6+
4- pair (720 mA/pair)	11	7.5
2-pair (720 mA/pair)	6	4

Table 2 - Temperature Rise (deg C) for 100 cable bundle.

One of the provisions in the new draft standard for Type 2 operation is a cable derating for ambient temperature. The current draft requires a 10°C reduction in the maximum ambient operating temperature of the cable and a maximum current limit 600 mA/pair.

The maximum current limit of 600 mA/pair is not sufficient to deliver 30 watts to the powered device (PD) using two pairs.

There is a recommendation forthcoming, as a ballot comment, to amend or remove these constraints. A current of 720 mA/pair for 2-pair powering would meet the original 30 watt objective.

Table 2 also shows that Category 6 + (Category 6 cabling with 23 AWG conductors) can deliver up to 60 Watts of power (720 mA/pair over 4-pairs) without exceeding the 10 degree C cable derating for ambient temperature.

As you can see, the subject of remote powering raises some important issues relating to how much power can be delivered, under what conditions and over which type of cabling. This will be resolved over the next year as the PoE Plus standard is further refined and finalized.

From the results presented so far, there is an additional benefit to install better cabling (low loss Category 6 or Category 6A) for powering remote equipment. **CNS**



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