Advantages of Using 0.240" Small Diameter Cables for Category 6A Installations

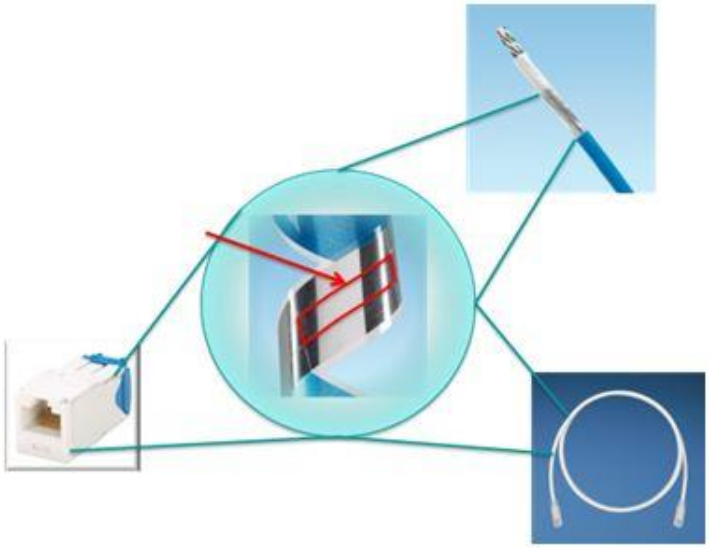
INTRODUCTION

The introduction of Category 6A cabling allowed a single cable to carry 10x the information over prior categories by supporting 10GBASE-T transmission at lengths up to 100 meters. The major innovation that allowed this to happen was improvements in alien crosstalk, or coupling between adjacent channels.

Category	Class	Maximum Bandwidth	Major Improvement over Prior Category / Class
5e	D	100 MHz	N/A
6	E	250 MHz	Internal NEXT, FEXT (ACR-F), and Return Loss
6A	E_A	500 MHz	Alien Crosstalk

The simplest way to meet the demanding alien crosstalk specification was to increase the distance between the wires in adjacent channels. This was initially done by some cable vendors by just increasing the cable diameter and why some vendors Category 6A cables are significantly larger than their Category 6 cables. Unfortunately, this increase cable diameter made Category 6A cables more difficult to work with.

Panduit recognized the difficulty in cable management caused by this increase in cable diameter and developed MaTriX Technology. MaTriX Technology utilizes discontinuous metallic elements to eliminate coupling between neighboring channels. By adding these discontinuous metallic elements, Panduit was able to offer a Category 6A cable with a smaller diameter. This technology is available on the cable, connectors, and patch cords.



CATEGORY 6A SMALL DIAMETER CABLES

Panduit recognized that the MaTriX Technology had the potential to solve new problems. Our engineers found that it was possible to further reduce Category 6A cable diameter using MaTriX Technology with thinner gauge copper, with the tradeoff of adding extra attenuation per unit length. Panduit settled on using 26 AWG wire, which meant the maximum channel length would be limited to 70 meters. This maximum length was deemed sufficient for nearly all copper data center runs. In summary, Panduit MaTriX small diameter (TX6A-SD™ 10Gig™) cables offer:

- The smallest Category 6A cable on the market (0.240”), similar to Category 6 cables
- Cost advantage over existing Category 6A since it uses both less copper and less materials
- Same fill ratios and pathways as you would for Category 6 cables

Panduit Category 6, Category 6A Small Diameter (TX6A-SD™ 10Gig™) and Category 6A Cables (TX6A™ 10Gig™)

How Does Panduit Small Diameter Compare to Standard Panduit Category 6A Cable?

The only limitation is the 70 meter maximum channel length (60 meter permanent link, 10 meter of patch). The Panduit TX6A-SD™ 10Gig™ Copper Cabling System meets all of the electrical performance requirement specified in TIA and ISO standards with the same headroom warranty as our 100 meter solution.

Parameter	Standard MaTriX (TX6A)	Small Diameter MaTriX (TX6A-SD)
Maximum Channel Length	100m (10m of patch)	70m (10m of patch)
Horizontal Cable AWG	23AWG	26AWG
Horizontal Cable OD	0.300"	0.240"
Meets Cat 6A Alien?	Yes	Yes
Headroom Warranty?	Yes	Yes
PoE Limitations?	None	None

Guaranteed Channel Headroom		
Parameter	TIA Cat 6A	ISO Class E_A
Insertion Loss	3%	3%
NEXT	3.5 dB	2.5 dB
PSNEXT	5 dB	4 dB
PSACR-F	10 dB	10 dB
Return Loss	3 dB	3 dB
PSACR-N	6.5 dB	6.5 dB
PSANEXT	2 dB	2 dB
PSAACR-F	10 dB	10 dB
* Electrical values are above specified standards and consist of worst pair margin per ANSI/TIA-568-C.2 Category 6A and ISO 11801 Edition 2.2 Class E_A standards.		

With small diameter TX6A-SD™ 10Gig™ cables, Panduit offers Category 6A performance at a Category 6 cable size and price.

Standard Compliance and Small Diameter Category 6A Cables

The ANSI/TIA-568-C.2 and ISO 11801 Edition 2.2 Class EA cabling standards mention that horizontal cables use 22-24 AWG wire and be capable of supporting up to a 100 meter channel. By this definition this cabling cannot be fully compliant to the mechanical requirements proposed by the standards.

However, the ANSI/TIA-568-C.2 also specifies transmission requirements for a channel such as near-end crosstalk (NEXT), return loss, insertion loss, and power sum alien crosstalk (PSANEXT). The Panduit TX6A-SD™ 10Gig™ Copper Cabling System fully meets all these transmission requirements, provided the channel length is 70 meters or shorter. *When adhering to the less than 70 meter channel length restriction, all installations with Panduit TX6A-SD™ 10Gig ™ Copper Cabling System will pass Category 6A field testing.*

How do I determine the de-rating of the channel if I want to mix TX6A-SD™ 10Gig ™ 26 AWG and TX6A™ 10Gig™ 23 AWG Cable?

The standard channel de-rating formula can be used. TX6A-SD™ 10Gig™ cable (patch and horizontal) have a de-rating of 1.42, Category 6A 23 AWG cable has a de-rating of 1.0, and Category 6A 24 AWG patch has a de-rating of 1.2.

(De-rating of 23AWG horizontal)(Length)+(De-rating of SD)*(Length)+(de-rating of patch)*(patch length) < 102 m.*

For example, if there is 39m of TX6A-SD™ 10Gig™ from the T/R room to a zone box (1.42 de-rating), and know there will be 2 meter of TX6A-SD™ 10Gig™ patch on both ends (4 meter total, also 1.42 de-rating), one can have up to 41 meter of regular TX6A™ 10Gig™ cable (1.0 de-rating) from the zone to the outlets.

Are there any limitations with Power over Ethernet? No?

Panduit TX6A-SD™ 10Gig™ cables fully meet the guidelines for 100 cable bundles of TSB-184 Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling to support the maximum power delivery specified in the existing 802.3at PoE standard (25.5W). This guideline is concerned with temperature rise within center cables in a large bundle of cables. Panduit has tested and verified the TX6A-SD™ 10Gig™ solution meets all of the requirements for bundles up to 100 cables. Therefore the TX6A-SD™ 10Gig™ cable can be deployed for POE/POE+ applications the same as 23 AWG TX6A™ 10Gig™ cabling with no concern on bundle size and power usage.

Does smaller diameter cabling cause increased power consumption? No?

One question that has come up is whether or not Panduit TX6A-SD™ 10Gig™ cabling requires an increase in the power consumption caused by the dynamic power scaling or power back off feature in the equipment. Hence, the question is does 70 meters of TX6A-SD™ 10Gig™ use more power within active equipment ports than 70 meters of 23 AWG TX6A™ 10Gig™ cable. The short answer is the power savings is negligible.

Dynamic power scaling was developed for shorter links in order to reduce the amount of noise in a system. For short channels where the loss in the cabling is low and the noise is high, the power backs down in order to reduce the noise. This is done primarily for point-to-point links with lengths below 10 meters. By reducing the signal power, the noise coupling to an adjacent channel is reduced, and thus the noise is simpler to compensate. Hence, the dynamic power scaling does not try to save power and small diameter cabling does not increase power usage.

Additionally, TX6A-SD™ 10Gig™ cables promote better airflow and cooling, which in turn requires *less* power to cool.

Does the equipment have trouble compensating for noise? No!

Active equipment like switches or routers have mechanisms to cancel noise from the cabling system. Examples of this noise can be near-end crosstalk (NEXT) or return loss. There have been some questions as to whether or not the equipment is able to compensate for this noise as effectively due to the fact the insertion loss for this type of cable is different than a standard 100 meter solution.

In short, the change in insertion loss with small diameter cabling does not have any negative effect on how the equipment cancels noise. The key parameter that effects how the equipment cancels noise is propagation delay. In the case of small diameter cabling, it has a propagation delay that is similar to a 100 meter solution. Hence, the propagation delay of a 70 meter TX6A-SD™ 10Gig™ looks almost identical to 70 meter of the 23 AWG TX6A™ 10Gig™ fully compliant solution. The equipment has no issue using TX6A-SD™ 10Gig™ cabling relative to noise cancellation.

Can I make zone cords with Category 6A Small Diameter cables? Yes!

Panduit CJ6X88TG jack modules can terminate solid and stranded conductors with wire sizes ranging from 22 to 26 AWG.

Can I use small diameter cabling for my enterprise installation? Yes!

Panduit small diameter Category 6A cabling can be used for an enterprise installation provided no channel lengths exceed 70 meters. It has the same fill rates as Category 6, competitively priced, has no limitations on Power over Ethernet, and the same headroom warranty as the Category 6A 100 meter MaTriX solution.

For more information visit ***www.panduit.com/matrix***

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