

To: 3P Customers and Business Partners

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3P Newsletter No. 9/2006**Twisted Pair Cables with CCA Conductors (Copper Coated Aluminium Conductors)**

Copper has become an expensive material and a major part of the costs of a communication cable come from the copper raw material. A reduction of the copper in the cable would therefore seem very attractive. However, technical requirements for the cables are setting the lower limit for copper reductions and basically I consider that the communication cable producers have **generally** reduced the copper conductor diameters as much as is reasonable to be price competitive on the market. Cables with larger than the traditional minimum copper diameters are found, but they then normally serve the purpose of offering additional performance. This could for instance be to allow complying attenuation performance for the full 100 metres channels also at higher temperatures.

An evident way to reduce cable costs would be to use cheaper metals than copper, and aluminium could at a first glance appear to be an attractive alternative. However, bare aluminium has some problems with strength, conductivity, surface resistance and corrosion (in very humid environments) making it an unsuitable conductor material for communication cables. For other cable types bare aluminium has been and is used as conductor material, especially during times when copper prices peak as they are now.

With copper being very expensive and bare aluminium technically poor a mixed alternative, CCA conductor cables, are appearing on the market. The non-conformance of CCA twisted pair communication cables is the subject for discussion in the present 3P Newsletter. The below discussion only concerns twisted pair communication cables. **Any use of CCA conductors in other cable types, for instance coax cables, is not in any way considered and may not be covered by the discussions in the present 3P Newsletter.**

The discussions of the present 3P Newsletter are based on experience with materials and earlier

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failure analysis of aluminium conductor cables. 3P testing of CCA type twisted pair cables has not been done.

1. Market situation for CCA twisted pair cables

In the past year 3P has received a number of market inquiries about CCA twisted pair cables. The price advantage of these cables seems to create a market space taken from the normal copper conductor cables, as users disregard or do not realise the technical limitations. The CCA twisted cable types were essentially unknown just two years ago, but it appears that they are now becoming generally available.

2. CCA conductor technology

The CCA conductors contain an aluminium core covered by copper. This combines the superior conductivity and surface resistance of copper with a cost reduction due to substitution of copper in the center with the much cheaper aluminium.

Technical disadvantages are lower tensile strength, resistance and flexibility as the aluminium contributes negatively to all three parameters. The degradation of performance will depend on the amount of copper being substituted with aluminium, i.e. the thickness of the copper layer.

3. CCA twisted pair cables fail specified requirements

The CCA conductor twisted pair cable construction is not allowed by IEC and CENELEC cable standards. For all cable categories it is stated that conductors must be copper, which excludes CCA even before its potential technical limitations are considered. The technical limitations of the CCA conductor twisted pair cables will most probably always prevent their application and it is strongly recommended by 3P not to consider these cable types unless carefully evaluated that the specific installation can accept any lower performance of the cables. The critical points of CCA conductor twisted pair cables will include:

A) Attenuation of the cable.

Attenuation will be worse than for the same cable having copper conductors due to the higher bulk resistance of aluminium. **It means that long permanent links and channels may have failing attenuation performance in field testing or actual use.** Potential users of CCA twisted pair cables should first evaluate any needed reduction in installation length caused by the higher attenuation.

B) Breaking strength of the cable

The breaking strength will be lower than for the same cable having copper conductors due to the lower tensile strength of aluminium. **It means that pulling of the cable may lead to breaking of the conductors or complete cable.** The TIA/EIA specified breaking strength of the cable, minimum 400 Newton, will probably be critical to pass. Any potential user of CCA twisted pair cables should first evaluate the breaking strength of the cable for compliance with ANSI/TIA/EIA-568-B.2 and also the elongation at break of the conductor, minimum 10 %, specified by ISO/IEC, IEC and CENELEC.

C) Bending of the cable

The bending performance of the cable will be lower than for the same cable having copper conductors due to the lower flexibility of aluminium. **It means that repeated bendings of the cable may lead to breaking of conductors.** This will possibly only be a problem for stranded cables subjected to many bendings in the equipment rooms or office environments. Any potential user of CCA twisted pair cables should first evaluate if the number of bends without conductor damage will be acceptable for the application of the cable.

4. Certification of CCA twisted pair cables

3P has never received any CCA type twisted pair cables for certification testing and therefore cannot supply detailed performance data for the critical points discussed in clause 3. I believe that passing of specified requirements in ISO/IEC, TIA/EIA, IEC and CENELEC standards will not be possible, and invite the cable market to supply documentation of any CCA twisted pair cable that complies with the specified requirements for the category in question. 3P will then evaluate the performance data as a basis for more detailed discussion of CCA twisted pair cable performance in a future 3P Newsletter.

Yours sincerely,
3P Third Party Testing

A handwritten signature in blue ink that reads "Poul Villien". The signature is written in a cursive, flowing style.

Poul Villien