

The real deal?

Cable counterfeiting isn't just an issue for the electrical supply industry; concern is growing that data cables manufactured from copper clad aluminium (CCA) conductors are entering Europe. Here **Iain Ballingall** of the **Approved Cables Initiative (ACI)** talks about the potential short comings and dangers of CCA cables within network applications.

Attention is once again drawn to the matter of CCA products through recently reported installation failures which have ultimately resulted in the expensive replacement of non-compliant CCA Category 5e cables with compliant copper products.

Ignoring advice

Despite the many articles now circulating the market highlighting the issues and risks associated with CCA data cable products the demand for ever lower market pricing, coupled with an apparent disregard for standards, some within the

wholesale industry and the less discerning resellers market are promoting Category 5e U/UTP and increasingly, Category 6 CCA U/UTP products into the UK.

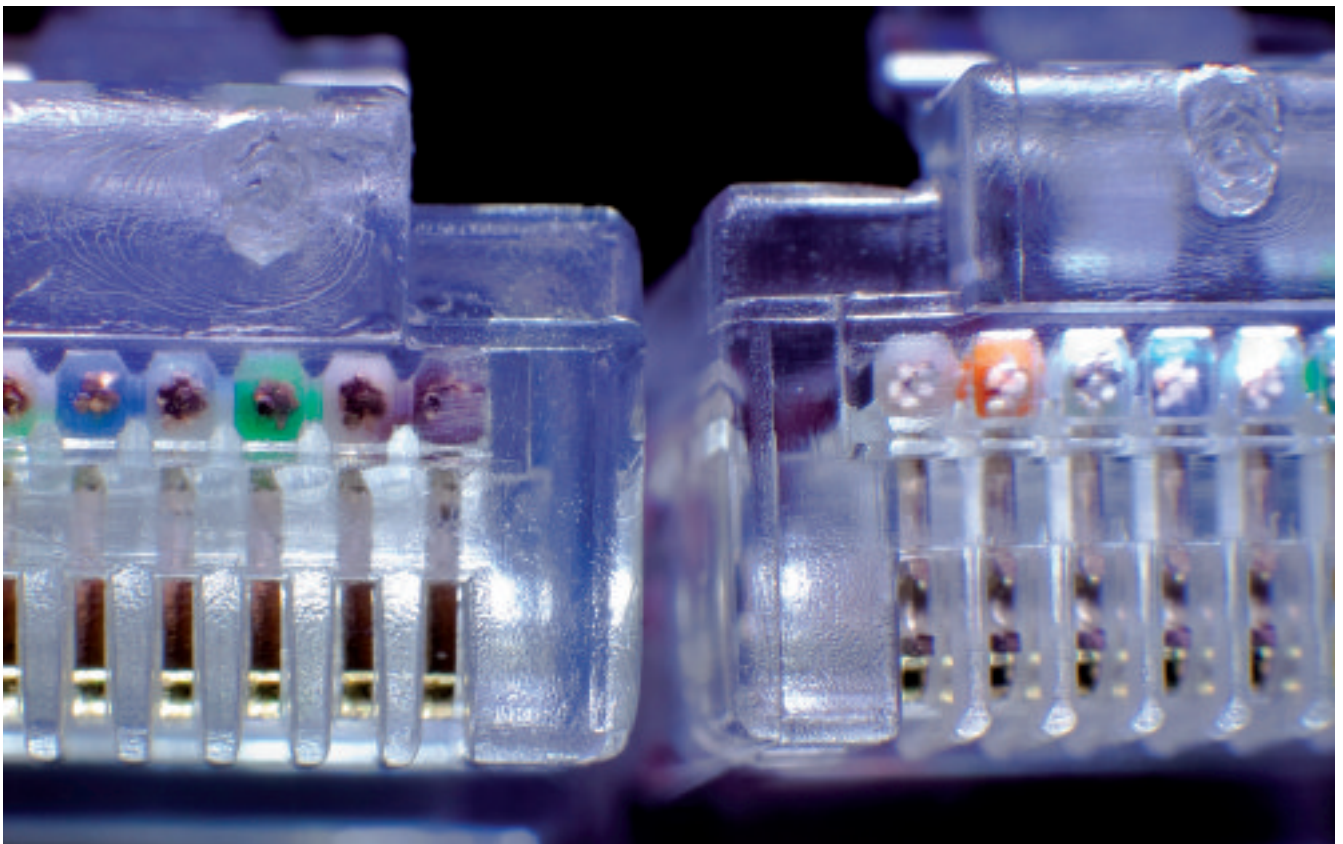
Typically offered for sale at low prices, CCA cables can frequently be found masquerading as fully compliant structured cabling products. The cables, which do not comply with published and internationally recognised cable standards for structured cabling networks (which require conductors to be either stranded or solid annealed copper), may look the part but cannot and should not be labelled as Category 5e, Category 6 or Category 6A compliant and should not be accepted at face value.

What are the issues with CCA cable?

CCA cables do not conform to the recognised European standards for structured cabling systems and cables. These cables are in fact made with aluminium as the core wire which is overclad with copper by welding or electroplating. The resulting wire typically only contains 20-40 per cent copper in comparison to the 100 per cent it should have.

Fundamentally aluminium is more resistive than copper therefore at low frequencies, where the main component of the insertion loss is resistive, the CCA cable performance will be compromised.

Copper compared with CCA conductor visible in a patch cord.



At higher frequencies above 2MHz the insertion loss primary component becomes reactive. The losses through the insulation become more dominant and the impact of CCA to that extent is less significant.

In shorter network links, less than 60m, the increased insertion loss will not be revealed when tested. In longer links of 80m or 90m however the links are likely to fail the low frequency attenuation requirements for the installed link.

While CCA cables may pass the basic transmission commissioning acceptance tests, they could then fail later under more arduous service conditions. They may also fail the basic transmission commissioning acceptance tests rendering the installation unusable.

Such cable can also exhibit more brittle conductors resulting in poor mechanical properties resulting in a compromised flexibility. Evidence of a recent installation completed using alleged CCA Category 5e cable revealed that the individual wires actually broke during the termination process resulting in unreliable termination and ultimately operational failures of the installed network.

Whilst CCA cables appear to be commercially attractive they will compromise a network's performance in the medium to long term due to their inherent mechanical and electrical weaknesses.

CCA cables will also produce higher than expected temperature rises when used to provide power - such as in Power over Ethernet (PoE and PoEplus). With PoE and PoEplus applications ever more popular and the fact that CCA cables exhibit oxidation of exposed aluminium at the points of connection (which may reduce the lifetime of the connections particularly when subjected to vibration and movement) it is clear these cable present a serious problem.

Warning signs

So why are CCA cables not acceptable?

Effectively within wires of the same diameter, the less copper in the conductor the shorter the transmission distance along the cable before the low frequency aspects of the cable are compromised.

All standards for balanced cable demand solid copper conductors. In the case of flexible patch cords or work area cables, the flexible conductors can be manufactured using multiple strands of smaller gauge solid copper, concentrically twisted together.

Size for size CCA conductors will compromise the low frequency insertion loss requirements of all cable standards including EIA/TIA 568C.2, IEC 11801 2nd Edition: 2010 and EN 50173 Part 1 for distance greater than 70m. More recently we have become aware of Category 6 U/UTP products being offered to the market with a higher percentage of copper within the conductor of around 45 per cent.

The specific manufacturer had also increased the diameter of the conductor in an attempt to compensate for the lower frequency performance with the product actually appearing compliant when tested in a full length link. These cables remain non-compliant due to the composite nature of the CCA conductor.

Patch cords and work area cables are also being manufactured with stranded CCA conductors and marketed as Category 5e and Category 6 compliant. Whilst patch cord cable standards do permit the use of metal plated copper e.g. tinned copper, they do not permit the use of copper plated on any type of metal e.g. CCA (aluminium) or indeed CCS (steel).

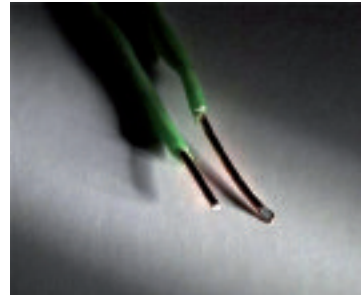
Albeit not immediately obvious to the untrained eye, low cost Category 5e and Category 6 U/UTP patch cords containing CCA conductors are increasingly being found in the market. Whilst most of these CCA patch cord products are likely to work electrically, in the short term any repeated flexing through repeated patching is probably going to result in mechanical failure.

Internationally ISO/IEC 11801 stipulates that balanced (twisted pair) cables must conform to the requirements of IEC 61156-5 (distribution cable) or IEC 61156-6 (flexible cable). For Europe EN 50173-1 requires that balanced cables conform to the TIA/EIA-568-C requires conformance to TIA/EIA-568-C.2.

Cable spotting

How can you tell if you have inadvertently purchased a CCA product?

The reseller may use terminology on their invoices or promotional material such as 'economy' or 'budget' and the less scrupulous may even attempt to pass off the product as environmentally friendly commonly using the term 'eco' in their description - only in this instance 'eco' will stand for economy or low cost and does not reflect the product's environmental credentials. Therefore be vigilant for:



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- Products described as CCA Category 5e or Eco Category 5e: These descriptions normally appear on the invoices or packaging but rarely on the cable product itself. If a CCA product is supplied, then it should be returned to the reseller for an immediate refund.
- Category 5e products marketed with a restricted installation length: In these instances the restriction on the installation length will be as a result of the increased resistance of the CCA conductor.
- Problems with conductors breaking during the punch down termination process: The reduced strength of the CCA conductor normally leads to poor retention of the wire within the insulation displacement connector (IDC) and consequently poor termination reliability. IDCs are designed for copper; CCA will snap off immediately or later on fail.
- Problems with oxidation: Aluminium does oxidise which will cause low and high frequency problems, which might not occur immediately after testing the installation. After some time the installation could slow down or even crash.
- Low frequency testing problems associated with the longer installed channels. Low frequency insertion loss failures on longer channels normally represents a good indicator that CCA has been used.
- Products described as CCA Category 5e or Eco Category 5e generally do not carry a CE mark and therefore should be avoided within the UK and Europe. CE marked products are associated with reputable brand names and should appear on the product packaging along side other compliance statements.

Visually it will be very difficult to tell unless the manufacturer has been honest enough to state on the packaging that the product has been manufactured using CCA.

data cable deception

Installers are advised to take extra care when purchasing data cables online.



Increasingly we are witnessing and receiving reports of conductors breaking during the termination process

Iain Ballingall has remained an active participant within the European wire and cable industry for the past 35 years working in senior business, marketing, technical and consultative roles. Operating as an independent consultant and industry expert, Iain is active in supporting the ACI develop data and telecom strategies to maintain cabling standards within the UK.



or terminated cables becoming 'open circuit' after being left for a short time. In the worst case we have witnessed, where the terminations have failed repeatedly, the whole network had to be replaced at substantial cost and disruption to the end user.

Otherwise the first time an installer will know that they have a CCA product installed is when longer links are tested and fail to meet the low frequency requirements of the standards.


Responsible purchasing

Whilst many point the finger at the Chinese for this problem, the ACI believes that although the Chinese may be responsible for these cables' manufacture they are not responsible for importing these products into the UK or European markets. The import and subsequent misrepresentation to the market is led by many UK distributors, wholesalers and resellers, some of whom, appear motivated to make a quick buck at the expense of the end user through miss-selling CCA products when Category 5e and Category 6 cables have been specified.

Whilst CCA products in local area networking applications do not represent

an immediate risk to health and safety they can and will affect the reliability of networks in the long term especially in light of the use of structured cabling to support critical IP devices such as security cameras, access control and other peripheral devices. Premature failure of the cable products because of the use of CCA conductors may leave some companies seriously exposed.

The UK has long advocated a free market policy however our market remains largely unregulated with action typically only taken against companies who increase the health and safety risk for the product user. Up until now, no UK regulatory organisation appears to have either the appetite or teeth to do anything about the import of non-compliant CCA cables.

The ACI has taken up this further cable mantle and would like to hear about any suspect structured cables including patch cords that may cause concern. As part of the organisation's ongoing communications work, the ACI will highlight any examples of CCA cables and use this information to also support its lobbying campaign to parliament. 

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