Current carrying capacity of data grade cables

(In reference to the clause 9 of the ISO/IEC 11801/CD (ISO/IEC JTC1 /SC 25 N 696, April 19, 2001)

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Leitmotiv

Karl Marx's theories failed miserably in practice. This might be inferred to as an inductive proof against of one of his own fundamental statements, so nicely expressed in his expose on dialectic materialism:

"Practice is the criteria of truth"

Introduction

In a previous expert contribution, the conditions for the determination of ampacity (current carrying capacity) were outlined. It describes that basically the ampacity depends upon the heat dissipation properties of the cables.

The heat dissipation of cables depends essentially upon their installation. If the cables are bundled, a case frequently happening, or passes in trays, the dissipation is restricted. Furthermore, the jackets of data grade cables are made generally relatively loose, thus providing inside the cable an additional insulating air layer, which impairs the heat dissipation markedly.

During the Nice meeting, while the current carrying capacity was discussed, it has been mentioned that the heating is to all practical purposes negligible.

However, Clause 9.2.2 sub-clause 2.6 indicated a requirement of 0.750 A per conductor.

Measurement

In order to verify if such a requirement is in the realm of reasonable possibilities, 100 m of a Category 5e cable has been coiled with increasing coil diameters. Then the coil was placed on a table, such that on one side of the cable windings were bundled, whereas on the opposite side the cables were individualized, to increase the heat dissipation. Then the cable was exposed to a constant current source.

Two trial were carried out, the first, connecting all conductors on each side in parallel. Of course it could be argued, that exposing all eight conductors to 6 A could result in slightly higher currents than 0.750 A in some conductors, and slightly lower currents in others. Therefore the test has been repeated, connecting all conductors in series.

The temperature at the surface of the cables has then been measured after a stabilization time of minimum 24 hours. The test was carried out in an air-conditioned room having an ambient temperature of 23 °C.

The temperature measured at the side of the bundled cables (thermocouple located within the bundle) and the surface temperature of an individualized cable on the opposite side of the bundle were 49 °C and 40 °C, respectively.

Hence, the results amount to a temperature rise of 17 °C to 26 °C.

This temperature rise is from a transmission point of view totally unacceptable.

Therefore the requirement will have to be lowered, to the level required by IEEE, i.e. 0.175 A per conductor. In this case the heat generated goes down by a factor of approximately 18.4.

However, even this ampacity should be verified, as in bundled or hybrid cables or in plastic trays or ducts, the cable density may go up substantially, and the heat dissipation at the same moment severely impaired.

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