

Voltage carrying capacity and current carrying capacity

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

Dr.-Ing. J.- H. (Jo) Walling

Consultant, Beaconsfield, QC, Canada

jo.walling@sympatico.ca

1. Voltage carrying capacity

In clause 9, sub-clause 2.5 of table 59 a “**Minimum d.c. voltage carrying capacity per pair**” is specified.

This characteristic is specified as being pair specific.

The characteristic of “voltage carrying capacity” is not known either in the power nor the communications cable industry.

If a new characteristic is specified, it is mandatory to establish :

- a suitable definition
- a realistic test method allowing to determine compliance with the requirements of this new characteristic

Alternately this specification requirement should be taken out, or replaced by a commonly used requirement.

It should be mentioned that a voltage rating is an acceptable alternative. Voltage ratings are based, generally upon a suitable ratio of the break-through voltage or dielectric strength. The dielectric strength of data grade cables, however, is clearly specified in IEC 61156-5 and IEC 61156-6.

Voltage ratings are specified as maximum values, and are generally subject to local safety regulations and are as such outside of the scope of a standard. On the other hand the commonly used voltage rating for communications cables is 300 V dc.

Hence, the suggestion to take out the sub-clause 2.5, or to describe the intended objective by suitable characteristic, including acceptable test methods or refer simply to the IEC 61156-5 and IEC 61156-6 standards.

2. Current carrying capacity

In clause 9, sub-clause 2.6 of table 59 a “**Minimum d.c. current carrying capacity per conductor**” is specified.

This characteristic is specified as being conductor specific.

If a new characteristic is specified, it is mandatory to establish :

- a suitable definition
- a realistic test method allowing to determine compliance with the requirements of this new characteristic

Alternately this specification requirement should be taken out, or replaced by a commonly used requirement.

Current carrying capacity, or better ampacity is determined traditionally in the cable industry based upon the maximum performance temperature of the insulated and jacketed wire. This maximum performance temperature of the wire in turn is based upon

- the heat generated in the conductor
- the heat generated in the insulation
- the heat generated in the jacket
- the heat dissipation properties of the conductor
- the heat dissipation properties of the insulation
- the heat dissipation properties of the jacket

The heat dissipation properties by convection and/or conduction of the insulated and jacketed wire depend upon its environmental conditions like

- ambient temperature
- maximum allowable temperature differential
- stacking density of the jacketed wires in ducts, raceways or plenums
- insulation material and its colour
- jacket material and its colour
- air movement

Under these conditions, **maximum ampacities or current carrying capacities** can be determined.

However, to specify a “Minimum d.c. current carrying capacity per conductor” as is done in sub-clause 2.6 requires either a test method for verification, or a procedure how to determine it. It is from a standards writing point of view not acceptable to specify some characteristic without having done any verification, either by testing or by computation, to substantiate the specified values.

It is, therefore proposed to establish a task group, to assess the real maximum ampacity or current carrying capacity of data grade cables as a basis for specification purposes.

To come up with such a calculation, some limits for temperature and temperature differential will have to be determined, and eventually specified. Based upon these values, and different cable designs, using appropriate materials, the heat dissipation will have to be calculated. With these values the maximum ampacity or current carrying capacity can then be determined.

As a guideline for it I should like to refer to a MathCad program (mcd-file), including description (doc-file) to be found on the "math-soft" web-site, and written by:

Steve Meyer

Code 543400D

China Lake, CA 93555

(619)939-6005

steve_meyer@rccgw.chinalake.navy.mil

For convenience, I will attach the two files.

It is hoped that these comments will elucidate some of the problems surrounding these two parameters.

Beaconsfield, May 15, 2001

Ps: Normally both issues addressed here should have been referred back over a liaison request to IEC 46C.