Current carrying capacity and indications for calculation of Power Cables and Wires

The guidelines for current carrying capacities of copper and aluminium are valid DIN VDE 0298 part 4 as well as DIN VDE 0276 part 603 and for the conversion factors DIN VDE 0276 part 1000.

The current carrying capacity of a cable should limited in such a degree that at all locations in a cable system which causes the generated heats under given proportions to lead safely in the environment.

The heat flow depends on the inner heat-resistance between conductor and outer surface of the cable and as well as from the heat emission to the surroundings.

The following recommended values are the current carrying capacity of cables for laying in earth and in air at normal operating conditions. Hints for the deviated operating conditions, see DIN VDE 0298 table 4 and DIN VDE 0276 part 603 and part 1000.

Indications for Calculation

- **For laying in earth**

– Deviating operating conditions with both conversion factors are to be considered, as these depend on both of specific heat-resistance and the grade of load.
– EVU-load (load grade) is the maximum load factor of 0,7. The conversion factors for the load grades 0,5, 0,6, 0,85 and 1,0 are to be taken in tables DIN VDE 0276 part 603 and part 1000. Intermediate values can be interpolate (1,0 used for permanent load).
– Laying depth 0,7 m. The load capacity decreases with increasing of the laying depth. Usual depth of laying is 0,7 to 1,2 m.
– As normal value of the specific ground thermal resistivity in moist areas is selected with 1,0 K · m/W . For dry areas the choiced value is 2,5 K · m/W, under consideration of the applied usual bedding materials of sands.
– For favourable ground conditions or with thermal resisted bedding materials, lower value under well consolidation can be achieved. For individual case, the values and upon that the resulted current carrying loads are to be determined.

- **For laying in air**

– The values stated in the tables for outdoor laying in the air are defined for permanent operation.
– The arrangement of the cables is corresponded the presentation in table 3, DIN VDE 0276 part 1000.
– Conversion factors for other laying conditions and the heaping of cables are shown in table 10 and 11, DIN VDE 0276 part 1000.
– The current carrying capacities of multi-core cables can be calculated by using the current load value for 3-core cables according to table 13 with help of the conversion factors.
– By using the cable channels or cable board underlays etc. the air temperature will be increased. In this case the conversion factors according to table 12 for deviating air temperature should be used.
– For outdoor installation in air, the ambient temperature is based on 30°C.

- Radiation of heats and solar influence must be taken into consideration, where a good air circulation is needed.
- A sufficient large distance is to retain between the cables and the heating elements, because badly insulated heating elements often raise additionally the temperature of the cable.
- Distance between the cable from the wall, floor or ceiling = 2 cm
- Distance between the cables being laid one above the other = 2xD
- Distance between the cable systems being laid one above the other = 20 cm
- Distance between the cables being laid side by side = 2xD
- **Specific ground thermal resistivity**
  - very moist area = 0,7 K · m/W
  - moist area = 1,0 K · m/W
  - dry area = 2,0 K · m/W
  - very dry area = 3,0 K · m/W

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